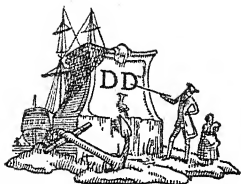


GENERAL PSYCHOLOGY

REVISED

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GENERAL PSYCHOLOGY



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SECOND PRINTING OF REVISED EDITION

TO
MY FATHER.

PREFACE TO THE REVISED EDITION

IN THE PREFACE to the first edition of this book, the author stated in substance that a textbook for the introductory course in psychology should acquaint the student with the fundamental facts and theories of the subject; that it should assist the student to acquire a knowledge of the scope of psychology and an understanding of the scientific techniques that have been developed for exploring basic psychological problems; and that it should awaken in the student an interest that would lead him on to more advanced courses in the field. Furthermore, the author stated that a desire to make the presentation interesting would not justify the omission of facts traditionally considered essential to a thorough grounding in psychology.

To repeat still further from the Preface to the original text: the author explained that he had confined his treatment largely to human psychology because he felt that the inclusion of extensive material from animal psychology would impose too great a burden on the student taking an introductory course. Since the emphasis, then, was to be placed on human psychology, with the expectation that the student should get a comprehensive view of human nature, no particular school of psychology was to be followed; the point of view should be synoptic.

The author has not departed from this point of view and from these objectives in this revision. A revision seemed to be indicated when it became apparent with use that the original book could be greatly improved, and

that it could be freed of certain revealed defects. Changes could be made that would result in a more effective execution of the original purpose.

These changes have been made: whole chapters have been reorganized; new material has been added; the treatment of some subjects has been expanded; and some material which was considered unimportant has been deleted. The sequence of topics is now in alignment with the ability of the students to grasp the facts and principles presented. Two major instances of this reorganization are: (1) the chapter on the nervous system has been enlarged with more stress on the organismic approach to a study of nervous functions; (2) the description of methods of measurement, admittedly difficult of comprehension, has been carried forward from the second chapter to the end of the book where it now constitutes one of the two chapters on "Personality: Its Measurement and Social Setting."

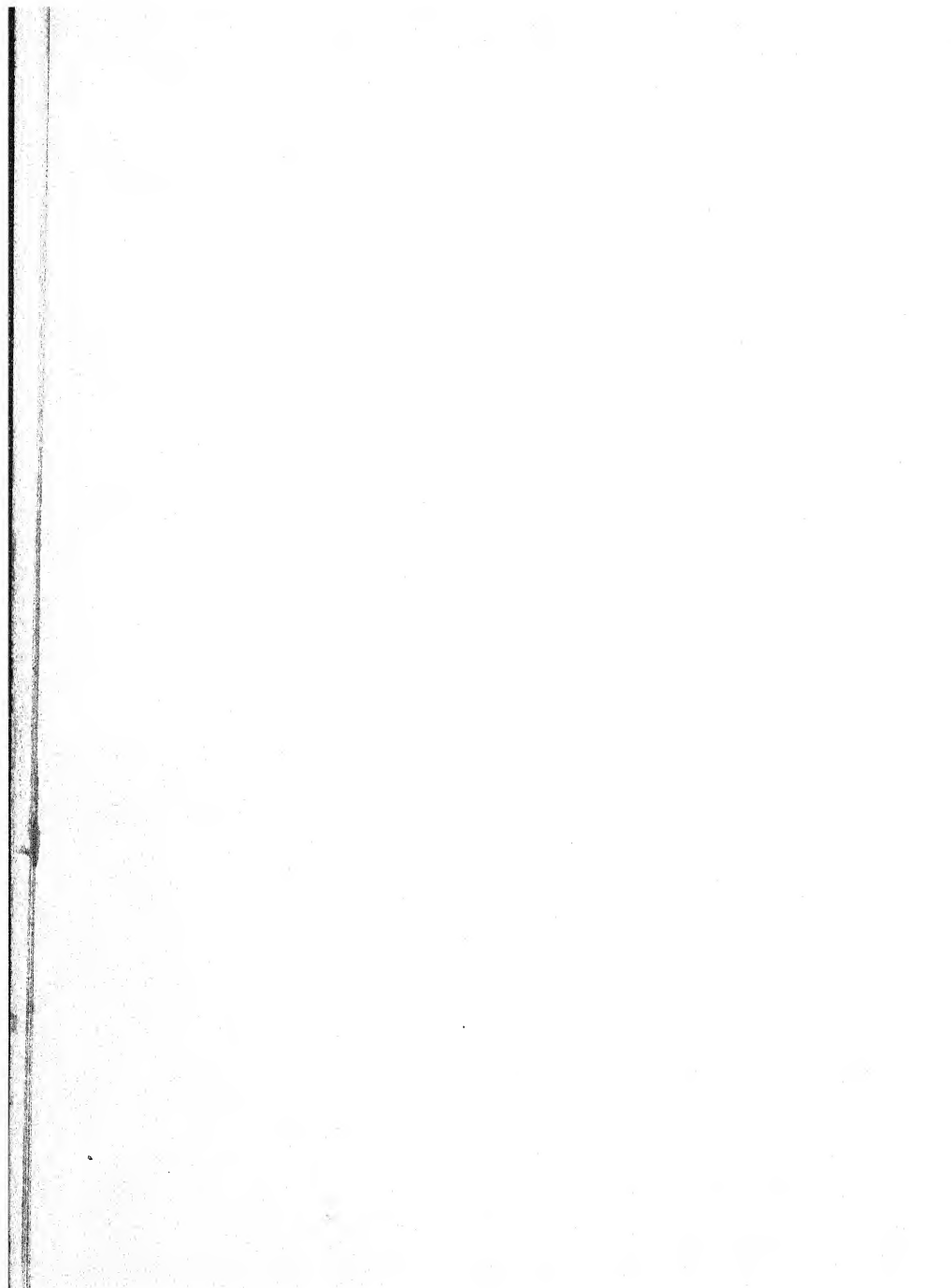
Instances of minor changes are too numerous to mention here; but whole sections have been entirely rewritten—for the sake of clarity—wherever experience revealed that certain phraseology had resulted in creating wrong impressions, and every effort has been made to bring the exposition up to date.

The author wishes to express his deep appreciation to several persons who assisted in the preparation of this new book: to Philip L. Harriman for his critical reading of the entire manuscript; to Brenton R. Lutz and Hudson Hoagland for helpful suggestions on matters of physiology; to Charlotte Boyer, Richard Decker, and Ed Reed for cartoons; to H. R. DeSilva for material on measuring the proficiency of automobile drivers; to J. R. Butler, J. G. Needham, and E. S. Brightman for encouragement and counsel; to Marion Maxim, Elsie Wyzanski, Leopold Bellak, Vincent Crowninshield, and Allan Hunting for

their generous help in the work of revision; and especially to Clara Colton Vaughan and Arthur F. Fultz for invaluable help offered unsparingly in a myriad of ways.

Needham, Massachusetts
May, 1939

W. F. V.



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PART I
ORIENTATION



Part I introduces the reader to the subject of Psychology by providing in Chapter 1 a survey of "Psychology: Unscientific, Pre-Scientific, and Scientific," and in Chapter 2 a description of the more important schools with their characteristic "Points of View."

Chapter 1 will describe two forms of unscientific psychology: the magical type, which offers a short cut to success; and the common-sense type, which consists of principles attained without adequate checks for their accuracy. Scientific psychology relies on experimental methods carefully devised and accurately administered. The main emphasis in modern scientific psychology is directed toward the study of behavior, aiming at its prediction and control. The procedures involved in the scientific method will be described and illustrated.

The various so-called schools of psychology present a confusing chaos of data unless it is realized that this variety is traceable to diverse interpretations of evidence and the degree of emphasis given to various methods. Chapter 2 will show how the Elementarists use the method of introspection to analyze the contents of the mind into its elements, and how the Configurationists use the same method to get at the contents of the mind taken as wholes rather than parts. The Functionalists and the Holists employ the method of introspection to explore the activities of the mind and the method of observing behavior to investigate the activities of the body. The Behaviorists, disapproving as they do of the introspective method, devote their attention exclusively to observing the behavior of the organism. These various approaches will be examined critically. The student must realize that each point of view provides important data since a complete account of an event must include all the relevant aspects of the whole situation.

PSYCHOLOGY: UNSCIENTIFIC, PRE-SCIENTIFIC, AND SCIENTIFIC

PSYCHOLOGY is the science which deals with the physical and mental activities of human beings as they strive to adjust to their environment. In its widest sense, psychology investigates the behavior of all organisms and seeks to formulate the principles underlying it. The psychologist observes the activities of human beings and of animals in all sorts of situations. He seeks to explore the inner mental processes of human beings as they meet the varying demands of their environment, whether under the controlled conditions of the laboratory or in real-life situations. Thus he proceeds to build up the science of behavior by careful observations of other persons and of animals, as well as by collecting reports on the mental processes which accompany human behavior.

In the world at large the term *psychology* conveys different meanings to different people, for some think of psychology as an easy way to social and financial success; others think of it as living in the light of ordinary common sense; and still others think of it as a technical study in the realm of natural science, associated with laboratories and learned experimentation. It is with this last kind of psychology, scientific psychology, that we shall be primarily concerned.

I. UNSCIENTIFIC PSYCHOLOGY

There are two prevalent forms of unscientific psychology: the magical psychology of quacks who promise the

gullible public that success can be achieved, without effort, by living "magnetically"; and the common-sense psychology practiced by most of us when we solve the everyday problems of living without any resort to scientific guidance.

A. Psychology as Magic. To the public at large "psychology" is a branch of mysterious magic. The "psychologist" belongs in the same category with clairvoyants, palmists, and astrologists. One charlatan describes himself, in the grand style, as "numerologist, biographer, psychologist, astrologer, crystal seer, psychic, and prince of mystics." Like the witch doctor and the sword-swallower the "psychologist" is naïvely supposed to have at his command secret powers which enable him to perform miracles. He may not be able to pierce a two-inch board with his magic eye but he is erroneously credited with having a bag full of tricks no less astonishing to the credulous onlooker. For reimbursement proportional to the remarkable capacities he claims, the quack "psychologist" fraudulently promises to reveal to you the secret of getting what you want to get, be it money, luxury, success, or love.¹

Human nature, according to the magical point of view adopted by some of these mountebanks, is essentially electrical. You have probably felt a tingle when your foot was asleep, or when you held hands with your beloved. Such experiences are interpreted for the gullible public as manifestations of a mysterious electrical force by which, if you are in the "know-how," you too can develop instantaneous personal magnetism. After you have learned to project magnetism through your finger tips, sparks will fly from you when you shake hands. A million-dollar personality is yours if you buy the book.² "Folks," we are told, "are never the same after reading this book."

¹See D. H. Yates: *Psychological Racketeers*. 1932.

²Edmund Shaftesbury: *Instantaneous Personal Magnetism*. 1926.

One of the choice documents in this "world of dreams come true" is *Spunk*. The author, whose photograph adorns his advertisement, modestly hails himself as "the greatest psychologist that any age has developed. The press, the pulpit, and psychological investigators attest to that. . . . For he has taken this amazing study where James left it and has added tier upon tier of knowledge to its fascinating structure." *Spunk* tells us that "anybody can have spunk, if he will." It's all in the mind. Think "success" and you'll be a success. *Spunk* goes on to assure us that "as a rule, the more defeats a man has the greater will be his power in the end." Early failure, according to this spurious logic, is a presage of later success, for Washington, Lincoln, Grant, and Wrigley were disappointing in the early stages of their careers. "When you are down in the mouth, remember Jonah. He came out all right. . . . It is always darkest just before dawn." All you need to achieve success, young man, is spunk—ability might come in handy but it is not essential. "If you are getting plenty of knocks, kicks, thumps, black eyes, and jolts, it probably is due to the fact that you are an unusual man."¹ Here is optimism, plenty of optimism, but I fear it is too superficial to encourage the critical reader.

The wide appeal of the quack psychology which promises a short cut to happiness and success is indicative of a vital need which academic psychology has too long ignored. There is no doubt that we are all harassed by emotional stresses which deprive us of that courage and energy which are necessary for the victorious life. Psychology can be an aid in the daily routine, but one must beware of get-rich-quick schemes that promise bigger returns than the assets of average human nature warrant. I cannot promise to tell you in this book how to make a fortune, but I

¹David V. Bush: *Spunk*. 1924.

can promise to give you a new interest in human experience which will lend more fascination than ever to that enigma which puzzles all of us, laymen and psychologists alike—human nature.

B. Psychology as Common Sense. Every mature human being acquires a working knowledge of psychology without undertaking a formal study of the subject. The student who begins a course in physics or chemistry starts with an initial ignorance which is more or less complete. On the other hand, the person who commences a formal study of psychology discovers many facts which are already familiar to him. Southey was practicing psychology when he discovered that his insomnia could be cured by recalling the lecture room of his college days, and the professor parading his soporific erudition before the yawning students. He was merely using that common sense of which we all possess some share. Psychology is to some extent a matter of good old plain "horse sense."

Modern psychology, according to Bertrand Russell, consists of the discovery by the professors of what everybody else has always known. It is always reassuring to the man of the street to have the scientists burst into print with the discovery that school teachers should motivate their pupils, that people forget most of what they learn in school, and that the educational program should be child-centered rather than school-centered. In order to impress the naïve person that psychology is something more than mere common sense, if one is to believe many misinformed people, the professors have invented a technical terminology by the use of which they can describe the obvious in incomprehensible terms, thus converting common sense into science through the medium of premeditated ambiguities.

Every parent is a psychologist when he faces the problem of training his children; every child is a psychologist

when he confronts the task of eluding parental discipline; all husbands and wives are psychologists when they work out their mutual adjustments for the best interests of the family. The proper rearing of children is a problem in psychology. Suppose your child has developed an aversion for its bath by swallowing some of the soapy water. Common sense and psychology agree that it is wise not to take the child to the bathroom for a time. Give it a sponge bath in the nursery for a day or two; then use a wash basin with a little water in it. Increase the water in the basin. Begin to use a wetter sponge. In a few days you can take the child back again to its regular bath. It is cruel and disastrous to force the child into the tub of water, as some unthinking parents do, since violence only serves to aggravate the fear and thus to retard its eradication, results which are undesirable for all concerned.¹

Many parents, beset with the problems of rearing their children, have found helpful guidance in the sage, common-sense counsel offered by Angelo Patri, whose syndicated newspaper column and radio talks have received wide attention. In one of his talks on "Your Child's School Marks," he treated the problem as follows:

Tonight I am going to say something about school marks. Let's see what happened to Lucia.

She came home from school looking glum, very glum—the sort of a glumness that is covered with a set jaw and a borrowed feeling of righteousness.

"Well, Lucia, what's wrong today?"

"The teacher says I cheated in the test. She gave me a failure—two failures."

"Did you cheat, Lucia? Did you?"

"She says I did."

"But did you? I am asking."

"I only looked across at Helen's paper."

"And then what did you do?"

¹See J. B. Watson: *The Psychological Care of the Infant and Child*, pp. 67-68. 1928.

"Teacher says I changed my answer."

"Teacher says—teacher says. What do you say, that's what I want to know. Tell me the truth. Did you look at Helen's paper and then did you change your answer?"

"Yes."

"That's all. And that makes you a cheat. You are a disgrace. How could you? What will people think of you? Why, oh, why did you do it?"

"I don't know."

Tears came, and mother and child wept together. It was all unnecessary, so futile.

Now—whose fault was it—Lucia's? Mother's? The teacher's? Each had a share in it. At home somebody kept asking Lucia, "What did you get in arithmetic today? What did Helen get? Did you get a higher mark than Jane? Good enough. Don't let any of them beat you. Are you the top of the class? No—well, I'll be satisfied with an average of 90. Make 90 and I'll give you a new wrist watch. The best that money can buy. But don't fall below 90 whatever you do."

The teacher contributed her share. She dwelt too long on the wrong values. She felt efficient only when she held up the class averages. "All the children do well in my class. Here they are. Look at them, the smartest class in the school. All those that got 100 per cent in grammar, stand up. Now those who got 90 per cent, no, not in the same aisle but in the next—yes—that's right. Now the 80's in the next aisle. Anybody who got below 80 sit right where he is. Eighty isn't good enough for this class."

And they do. They sit right there, shamefaced and shrinking. But the next time, watch out. Lucia gets a chance to compare answers with Helen and she does. She feels driven to it. The thought of sitting in the seat of the scorned spurred her to desperation. She must get 90. She must! Who is to blame when a child is driven beyond his strength? No one wants to sit with the unfit.¹

An understanding of human nature is an important factor for success in any field of endeavor. The ability to

¹"Your Child's School Marks," Talk No. 7, a broadcast in a series entitled *Your Child*, by Angelo Patri. Reproduced through the courtesy of Angelo Patri and the Cream of Wheat Corporation.

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get along with people is more essential than technical training for many types of work. Psychologists suggest certain principles to follow if we are to win friends and influence people. Dale Carnegie tells us to get interested in other people, to smile, to remember names, to be good listeners, to talk in terms of the other man's interests, and to make the other person feel important. Be lavish in your praise and sparing in your criticism.¹ Link urges us to be unselfish in our social contacts, and to recognize the necessity of self-sacrifice and self-discipline in controlling our immediate impulses, for otherwise we shall become emotionally unstable, neurotic, and unhappy.² White counsels us to make our suggestions to people indirectly instead of giving them orders, since commands provoke rebellious reactions. Accordingly, a woman who wants her husband to shave before dinner will not issue an order to that effect but rather remark casually, "I think you'll have time to shave before dinner." Thus she wins cooperation by respecting "the feeling of personal worth."³ Webb and Morgan point out that the way to win a person's friendship is not to do him a favor but to allow him, with good grace, to perform a kindness for you.⁴

The above precepts offered by these counselors in human relations are sound. We recognize the validity of the principles expounded because we have learned from experience that they work. As Link himself confesses, "the findings of psychology in respect to personality and happiness were largely a rediscovery of old religious truths."⁵ Though the basic rules for happy living are hoary with age, we need to be reminded of the ancient wisdom because, in the rush of attacking our immediate problems, we lose

¹Dale Carnegie: *How to Win Friends and Influence People*. 1936.

²H. C. Link: *The Return to Religion*. 1936.

³Wendell White: *The Psychology of Dealing with People*. 1936.

⁴E. T. Webb and J. J. B. Morgan: *Strategy in Handling People*. 1931.

⁵Link, *op. cit.*, p. 7.

sight of the maxims that promote our welfare in the long run. It is all common sense—and good psychology as well.

A minister is often called upon to advise his charges regarding their personal problems. Within limits, he may give sage counsel without being profoundly versed in the tenets of academic or clinical psychology. For example, a clergyman was consulted by a woman who lay awake nights. She went to bed early in an effort to “catch up on her sleep,” tossed anxiously most of the night in search of repose, and then stayed in bed most of the morning to get “the rest she needed.” She was advised to stay up until eleven o’clock at night and to get up at seven in the morning, whether she felt rested or not. After several weeks she was enjoying her sleep from eleven to seven. The minister gave her sound advice based on common sense. Within limits, he was providing the wisdom she was lacking. Of course, medical counsel might have been necessary had the case been a more serious one.

The scientific approach to problems is far more likely to be accurate than the quick, easy conclusions of the unscientific everyday observer. For example, President Roosevelt’s plan for the reorganization of the Supreme Court raised the question as to whether the Justices were fit to perform their duties after they had reached the age of seventy. Aroused citizens argued one way or the other, according to their partisan leanings, without any misgivings to disturb them in their dogmatic assertions. The only way to settle the problem scientifically would have been to put aside argumentation and gather objective evidence regarding people in general who are seventy and older and the specific Justices in particular, and to compare their intellectual and emotional qualifications with those of younger men on the bench. Tests are more fruitful than bickerings in determining the answer to such an issue.

Thus we find that one deficiency in everyday psychology is the lack of painstaking research and hard thinking. Since common-sense psychology is interested only in what is immediately practical, there is a tendency to neglect technical problems which are important scientifically, even though their significance may be less obvious than problems of everyday concern. How many people, for example, ever wonder how it is that we see an object as one object although we look at it with two eyes? The natural reaction to such a question is nonchalance, for what difference does it make as long as one can see all right? Investigation of such problems requires more than a casual interest in psychology.

A further drawback of common-sense psychology is its haphazardness, its lack of organization. Scientific knowledge can only be established by the collection and classification of miscellaneous observations. Huxley defined science as "perfected common sense." Science can only develop when we set out to gather facts in an exact fashion, and when we organize those facts into a system of knowledge. As we shall see later, psychology has only become a science by adhering to definite rules of investigation and systematization.

The value of organizing observations in a systematic fashion may be exemplified in the procedure employed by a Middle Western public utility company to reduce the number of accidents among the employees who drove its fleet of cars. A constantly increasing accident total from year to year for the years 1925, 1926, and 1927 had called sharply to the attention of the operating executives the necessity for a thorough investigation. The general impression on the part of the executives seemed to be that bad weather or light conditions were responsible for many of the accidents. A survey of the 1928 and 1929 accidents quickly banished this theory, as it became evident that

bad weather conditions except in rare instances were not the conditions under which accidents increased. It was found that accidents reached their maximum frequency during the months of June, July, August, and September, a period of generally fair weather.

Another impression common among the executives was that accidents were largely matters of chance or "acts of God," and that anyone might have an accident. As the accident records grew in volume over a period of two years, an entirely new conception of the underlying causes of accidents began to shape itself. The records revealed that a group of accident-prone employees, small in number, but high in accident frequency, was contributing the major portion of the accidents for the year. In the year 1928, company drivers were involved in one hundred and seventy-six accidents, and more than 50 per cent of the accidents involved men having two, three, or four accidents within the year. At first it was thought that the greater frequency of accidents of these men might be due to their driving a mileage greater than the fleet average for the year. A check of this factor quickly eliminated that explanation. In fact, the men driving the greatest number of miles were conspicuously absent from the accident records, and other drivers, whose total mileage for the year was far below the average for the fleet, were constant offenders. From this point on, the theory that accidents were matters of chance was no longer accepted, and a study of the men involved, rather than the conditions surrounding the accidents, was begun.

Five of the worst offenders, who averaged two accidents a year during a three-year period, were subjected to psychological examination. Four of them were found to be definitely subnormal in intelligence, and the fifth man suffered from defective peripheral vision which prevented his seeing clearly where he was going.

The traffic accident record of one driver showed nine accidents in less than three years. In eight of these his truck had been hit from the rear. An examination of this driver disclosed poor depth vision, low intelligence, and extremely slow reaction time. Under these conditions, this man did not appear to observe the change of traffic signals quickly, and consequently was frequently making sudden stops at such signals. He was driving a truck with a very high cab that under certain conditions would obscure the view of the traffic light to the driver of the vehicle immediately behind him. Another difficulty was the fact that his truck, traveling only partly loaded most of the time, had very effective brakes, and even when he was aware of the necessity of the stop at a given street, he was in the habit of utilizing the full braking ability of his truck and maintained speed as long as possible before starting to bring his vehicle to a stop.¹

A "common-sense" attack upon the problem of accident prevention might, by chance, have brought about some benefits; but a scientific approach to the problem revealed the basic causes of accidents and furnished a sound basis upon which to proceed in eliminating them. Scientific psychology, as we shall see, has upset many "common-sense" opinions about human and animal behavior.

II. PRE-SCIENTIFIC PSYCHOLOGY

Before the reader can fully appreciate the psychology of our own scientific era, it will be necessary to trace the stages in the historical evolution of scientific psychology from pre-scientific psychology.

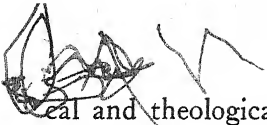
In tracing the historical development of psychology through its most significant phases, we shall find that the subject matter investigated by psychologists has changed from time to time. Psychology was originally a study of

¹Digested from a report by William C. Shriver.

the soul (*psyche*); it later devoted its attention to the mind; and latest of all it has concentrated upon that aspect of experience which we call behavior. We shall trace this evolution.

A. Soul. Psychology was, in the beginning, a study of the nature and activities of the soul. Presumably, the notion of the soul originated in various experiences. We may conjecture that primitive man lay down in his cave to sleep and had a dream. He dreamt that he was wandering in strange places, and yet he felt fairly certain that his body remained all the while exactly where it had reclined when sleep came. Probably his natural conclusion was that his soul left his body in dreams and returned when he awakened. Hence arose the superstition that you should not arouse a person suddenly from his slumber lest his soul fail to return. The soul also explained a man's shadow, his reflection in a pool of water, and the mystery of death when the soul (*anima* or breath) departed from the body for a better dwelling place. On the basis of such interpretations the soul came to be conceived as the essence, substance, or actuating cause of individual life, the vehicle of individual existence, separable from the body both in its nature and in its existence.

Psychology remained for centuries a speculative branch of learning indulged in by philosophers who located the soul anatomically without the aid of vivisection or laboratory technique. Some, like Descartes, located the point of interaction; but most philosophers wrote about the soul as though living man were already a disembodied spirit. One man's guess was as good as another's. Time was consumed pronouncing on the origin and destiny of man's divine nature, laying down the last word on such questions as whether animals, infants, or women possessed souls. It is no wonder that modern psychology, in striving to become a real science, is reacting against the philosophi-



cal and theological approaches to human nature. Some psychologists in their effort to purge their subject of non-scientific nomenclature have even discarded the notion of the soul. In this text the soul will be considered as the spiritual or moral aspect of mind. Thus, when a person's mind is directed towards ends which are ethically worthy, his soul may be said to be lovely.

B. Mind. Having rid itself of the soul as a study within its sphere, psychology turned its investigation to the mind. What is mind? Mind may be defined as conscious experience. The mental life is made up of such processes as perceptions, desires, thoughts, and actions, in so far as they involve "awareness." There are different degrees of awareness ranging from indistinctness to clearness. When an experience is clear, it may be called a conscious one; when it is indistinct, it may be called an unconscious one. Certain forms of behavior are unconscious in the sense that we do not have momentary awareness of the drives or motives or of the neural mechanisms involved.

Though conscious states are subjective and cannot, therefore, be described in objective terms, everyone who is alive knows what is meant by "conscious," for we are all conscious beings. This process which each of us calls his consciousness is all that we know immediately in this universe, since it is the medium through which we become aware of all phenomena. The only way in which we immediately know the world is through our conscious reactions to stimuli. We reach out and touch an object. Our tactual perception tells us there is an actual object present. In accepting the existence of the object, we must rely upon our consciousness which is reporting its reality. When we feel sure that our consciousness is telling us the truth, we call the phenomenon a fact.

Consciousness may be awareness of external objects, or

it may be awareness of one's own awareness. The latter is spoken of as self-consciousness. The capacity for self-consciousness is supposed to be limited to human beings who have matured two years or so. The infant is not conscious of himself; he is an individual but he does not know it yet—it is said, therefore, that he has not become a self or personality. The child discovers himself when he learns that the experience evoked by his own body differs from the experience aroused by external stimuli, either in the form of other persons or objects. When he touches a toy, he gets the tactual sensation which means "toy"; when he touches his own foot, he gets the sensation in the hand which means "foot" and he gets, besides, the sensation of being touched on the foot by his hand. His experience is that of himself touching himself, an experience which is different from his touching something external or something "not-self." The child is coming to realize that he is an individual.

All experience is the experience of some subject. Conscious states belong together in a unique way giving a unity to the mind. Your experience is experienced by you as yours; my experience is experienced by me as mine. Experience is for each individual a unitary affair in which the past, the present, and even the future are felt to hang together in an intimate personal way. Thus, through retrospection (looking back), Poe was able to tell how he wrote *The Raven*, and the laboratory student can report on how he solved a problem. Mind belongs to a self which is aware of the unique character of its individual experience. Any perceptions, emotions, thoughts, and actions belong to the mental life of somebody. As Allport says, "the outstanding characteristic of man is his individuality . . . There are only single, concrete minds, each one of which presents problems peculiar to itself." Experience is always personal. Each human

being must be dealt with according to the pattern of his individuality. Human nature is, in the last analysis, individual nature, a fact that scientific psychology is apt to overlook in its quest for universal laws concerning human behavior.¹

It is difficult to state just what consciousness is because it is intangible; but perhaps it will suffice to say that consciousness is what you know as awareness or as your experience. The ultimate nature of matter or mind is still a mystery. All of us think, but who knows what thoughts are, or just how thinking is done? A two-year-old child may be extremely animistic (attributing life to inanimate objects). When hot oatmeal is poured on the man in the bottom of her dish, she sets up a howl; she feeds her cereal to the Rastus man on the carton; she lays her doll down tenderly for her nap. Yet she could not explain the animistic tendency in her thinking. Consciousness is a fact in the personal experience of each of us, though, to be sure, no one has yet given an adequate definition of the term.

It is difficult to state what the mind is beyond the certainty that consciousness is experience. Our ignorance upon this metaphysical question is no excuse for denying the existence of mind, as is done by such a writer as Dorsey who asserts: "There is no such thing as mind. Every psychologist for 6000 years has written or talked on 'mind' and none of them agree as to what it is. So let us discard the term as being meaningless." The mind, therefore, has been cast overboard by some psychologists who feel that philosophers indulging in arm-chair speculations have contributed nothing of value to our comprehension of psychological problems.

Lest there arise some misunderstanding in this connection, it should be stated that it is the present author's

¹See G. W. Allport: *Personality; a Psychological Interpretation*, Chap. I, "Psychology and the Study of Individuality." 1937.

belief that a complete psychology must deal with mind or conscious experience as one part of its province. Those psychologists who choose to ignore the mind are neglecting a fundamental fact properly falling under their sphere of investigation. Modern psychology, however, must not think of the mind as a mystical entity existing independently of the physical universe but re-define the *mind*, as has been done in the preceding exposition, in terms of experience—individual experience definitely determined in its range and variety by the complexity of the individual physical organism.

C. Behavior. About the beginning of the twentieth century a movement was inaugurated by a number of psychologists to ignore the mind and to emphasize, instead, the study of behavior. These psychologists had become convinced that the study of the intangible realm of consciousness was an impractical pursuit. The progress of research into animal behavior revealed the possibility of developing psychology without resort to "mind." Animals could not give verbal reports on their "mental states." Investigators, accordingly, concentrated upon the observation and description of animal behavior. Animal psychology succeeded so well without referring to "mind" that it commended the same approach to human psychology. Psychology has, consequently, for some psychologists, turned its attention entirely to the description of behavior, and no longer deals with some mysterious entity called "soul" or "mind" or "consciousness" but, instead, observes the ways in which the human animal reacts to the situations of its environment. Thus as a natural science, psychology aims to keep as strictly to the natural-history point of view as do physiology and biology.

In order to establish itself among the sciences, psychology has made a conscious effort to divorce itself from the contaminating influence of those speculative philosophers

who for so many centuries stunted its growth. Modern psychology, however, has committed a tragic error in trying so insistently to separate itself from philosophy.¹ The revolt has had its wholesome effects in stimulating the development of experimental psychology, but scientific psychology must not forget that the basis of any science depends upon a sane philosophical background. The psychologist must remember that he is not simply dealing with facts, but that he is interpreting them in accordance with certain assumed principles. Since psychology, like every other science, must begin with certain premises, it will do well to ground itself in philosophy in order that its development may be initiated in the right direction.

One philosophical point of view which will guide us in summarizing the present discussion is the synoptic principle: that any study should have regard for all the phenomena under its survey if it is not to be one-sided and inaccurate in its conclusions. From this standpoint, psychology must respect the fact of mind as well as the fact of behavior.

A particular psychologist tends to isolate certain definite bodies of fact for his own investigation, making his selection in accordance with the background of his own special interests. Such a circumscription of investigation is not only legitimate but advisable in that it promotes progress by concentrating endeavor. At the same time, nevertheless, he must appreciate the fact that the limitation of his regard deprives him of a complete view of the field. He must pause, therefore, from time to time to realize the necessity for supplementing his own narrow outlook with a more expansive survey if he is to take in the complete panorama of facts properly denoted as within the scope

¹Philosophy is concerned with the ultimate nature of things. A part of its program is the formulation of basic principles for a unified interpretation of the universe.

of psychology. He must transcend his own limited standpoint in order to achieve a comprehension of all the relevant data embracing the subject matter of his study.

In our study of the human being, we shall endeavor to satisfy the synoptic ideal, by including the various aspects of human experience without regard for any single limited point of view. We shall be interested in the world of subjective facts, which we call the mental life, as well as in the world of objective facts, which we designate as behavior.¹

III. SCIENTIFIC PSYCHOLOGY

With the historical background in mind, we may duly appreciate the present status of psychology. In order to establish itself as a science, divorced, on the one hand, from speculative philosophy, and on the other, from practical quackery, psychology has found it necessary to emphasize its scientific aspects. Psychology has entered the laboratory where experiments have been conducted in accordance with the demands of science, and psychology feels today that it is worthy of being classed among the sciences.²

A. Science in General. There are two important characteristics of any science—the scientific spirit and the scientific method. Psychology acknowledges their validity, and has endeavored to develop a technique that scrupulously recognizes those characteristics in its practice.

1. The Scientific Spirit. The scientific spirit is one of open-minded inquiry. A scientist does not set out to find

¹Reading and experimental projects for each chapter will be found in the separate workbook designed for use with this text.

²See H. P. Weld: *Psychology as Science*. 1928; C. E. Ayres: *Science, the False Messiah*. 1927; H. Wickham: *The Misbehaviorists: Pseudo-Science and the Modern Temper*. 1928.

Weld's book treats psychology as a science, and Ayres' treatment of the subject is a critical analysis of some of the claims of science, stressing the viewpoint that scientists are not nearly as scientific as they purport to be. Wickham's volume affirms Ayres' thesis as applied to psychology.

evidence that will support a dogma he has set his heart on proving. His attitude is objective. He is ready to take the facts as they come, reserving his conclusions until all the data are in. He has no pet theories for the sake of which he is anxious to overlook contradictory evidence. He is willing to discard an hypothesis when experiment indicates its inadequacies. Charles Darwin exemplified the scientific spirit in his remark that whenever he discovered a fact which ran counter to his opinion or belief at the time, he made a specially careful note of it, because, as he said, we are so prone to dismiss unwelcome facts from our minds. The scientist enters an experiment with the intention of taking it seriously. He is not willing to toy with facts. He is cautious in avoiding premature conclusions. The scientific spirit has been defined as "an intelligent and disciplined Missourianism"—that is, the scientist is not going to believe a thing is so until the evidence is overwhelmingly in favor of its being so. Science, wherever it has flourished, has been characterized by a cautious, unbiased, curious search for the facts. 9

As scientists who are interested in psychology, it is important that we take, as far as is possible, the objective attitude which characterizes psychology as a science. Personal bias is out of place in science. An open-minded attitude is the only adequate preparation for the achievement of sound knowledge.

The scientific investigation of a problem yields results distinctly different from those obtained by a personal subjective approach. Wickman had teachers and mental hygienists rate the seriousness of various behavior problems in school children. The tables on page 23 summarize the results. The teachers were influenced by the pressure of educating children according to prevailing curricula. They were especially sensitive to those problems in behavior which disturb or frustrate the teachers' interests in

the educational achievement of their pupils. The clinicians were influenced by their professional interests and by specific instructions to consider "(1) the effect produced on the future development and on the social, emotional adjustment of the child by the possession of any behavior problem which is allowed to run its usual course; and (2) the need for remedial work, and the nature of remedial efforts, in treating the behavior disorders in question."¹

2. The Scientific Method. The scientific method involves three essential steps: first, the formulation of an hypothesis; second, the testing of that hypothesis by experiment, through the gathering and classification of data; third, the revision of the initial hypothesis in the light of experimental findings.²

There has been a persistent effort on the part of scientists to refuse to recognize psychology as a science, because it deals with the intangible stuff of consciousness which cannot be studied with the same accuracy as objective phenomena. A scholar describes his experience in looking for Einstein's masterpiece on relativity: "Recently I went to one of the biggest scientific bookstores in New York, and asked for one of Einstein's books. The clerk said that they didn't keep it in their general scientific department. When I asked him why, he explained that they didn't consider Einstein sufficiently scientific, and that I would find his books in their psychological department." The story is a simple illustration of the wide-spread feeling that psychology is merely a pseudo-science because it deals with the mysterious forces of the mind. One consequence of this hostile attitude has been the shift to behaviorism—

¹E. K. Wickman: *Children's Behavior and Teachers' Attitudes*, pp. 129-130. 1928. Published by The Commonwealth Fund.

²See E. S. Robinson and F. Robinson: *Readings in Psychology*, pp. 1-6. Revised edition, 1929.

See also Sir John Arthur Thomson: *Modern Science: A General Introduction*. 1930.

I. RATINGS BY TEACHERS:

Immoralities	Violations of:	Extravagant,	Withdrawings,
Dishonesties	Orderliness in	aggressive	recessive
Transgressions	classroom	personality	personality
against	Application to	and behavior	and behavior
authority	school work	traits	traits

II. RATINGS BY MENTAL HYGIENISTS:

Withdrawing,	Dishonesties	Immoralities	Transgressions
recessive	Cruelty	Violations of	against
personality	Temper	school work	authority
and behavior	tantrums	requirements	Violations of
traits	Truancy	Extravagant	orderliness
		behavior	in class
		traits	

RATING OF BEHAVIOR PROBLEMS IN SCHOOL CHILDREN

<i>more</i>	<i>more</i>	<i>more</i>
<i>serious</i>	<i>serious</i>	<i>serious</i>
<i>than</i>	<i>than</i>	<i>than</i>

to the study of behavior as objective material for observation and description. A solution, however, is ready at hand in the work of Karl Pearson. Pearson laid down the dictum that "the unity of all science consists alone in its method, not in its material."¹ If we accept Pearson's conception of science, then psychology can qualify as a science by applying the scientific method either to the study of conscious states, to the study of explicit behavior, or to both together. We shall observe how psychology has succeeded in its application of the scientific method.

B. Experimental Psychology. The recent development of psychology has been due to its emphasis on experiment. Psychology has resorted to the laboratory where phenomena can be observed under control. Since Wundt established his laboratory at Leipzig in 1879 and James set up his "brass instrument" investigations at Harvard, a host of laboratories have been equipped, where psychology is studied on an experimental basis.² Experiments are rigidly controlled, varied, and repeated.

The guiding rule of experimentation is to control all conditions so that only one single factor will vary at a time. A common form of control is attained by the division of the subjects into two groups. Identical conditions must be maintained for both groups except for the one factor which is being isolated. Suppose you want to ascertain the effect of a prospective bonus upon the efficiency of your employees. The first step in the procedure is to measure the performance of each worker. Then the employees are divided into two groups of equal size. Group I will work without the incentive of a bonus. This group is known as the "control." Group II will operate under conditions identical with those to which Group I is

¹Karl Pearson: *The Grammar of Science*, Part I, p. 12. Third edition, 1911.

²James was disappointed in his experiences with laboratory psychology. In his later years, which were devoted to philosophy, he expressed his contempt for experimental psychology by characterizing it as "brass instrument."

subject, except for the peculiar inducement of the bonus. Group II is known as the "experimental group." An ideal control would necessitate the regulation of such conditions as sleep, diet, family life, and amusements. Unless such factors remain constant, the investigator cannot tell whether superior performance is due to the promised bonus, or perhaps to happier home conditions. Such a perfect control in most experiments can only be approximated; the demands of sound experimentation may be satisfied, for practical purposes, by controlling the significant factors. Over the period of experimentation, the performances of both groups are measured under the two different sets of conditions—"no bonus" and "bonus"—to determine whether the bonus does or does not improve efficiency. This procedure is known as the control-group technique.

A variation of this technique is called *control by pairing*.¹ Preliminary measurements are made of the subjects with respect to the conditions which the experimenter desires to keep constant. Thus, in our example, the experimenter chooses his subjects in advance with reference to their resemblance to each other in amount of sleep, diet, and home conditions, instead of dividing them into two groups at random, as in the control-group technique previously described. Employing the technique of control by pairing, the experimenter matches individuals in pairs so that for each subject in Group I there is a comparable subject in Group II. The use of paired groups reduces to a minimum the major sources of error resulting from unequal selection. Small differences in final standing, then, are more significant than is the case where both the control and the experimental groups are selected at random. The larger the group from which the subjects are selected, the

¹See F. L. Goodenough and J. E. Anderson: *Experimental Child Study*, pp. 460-464. 1931.

easier it is to match the subjects accurately. Control by pairing has been used to great advantage in the study of identical twins, who are readily matched because of their identical heredity. This variation of the *control by pairing* technique is known as *co-twin control*, to be described later in some detail.¹

Control in psychological experiments demands that the instructions to the observer be definitely the same in all cases, and that, wherever possible, the stimulus be presented without the presence of the experimenter, since a smile or a variation in movement on his part may so affect the observer as to confuse the results.

The perfection of instruments has done much to improve the factor of control. Instruments have been devised for the mechanical presentation of stimuli, and for the mechanical recording of reactions, which make accurate measurements possible. In addition, trained observers, who are expert in reporting their experiences, are used. A given experiment is described in great detail so that the investigation may be carried out under identical conditions and the results checked with precision. The grave danger in the experimental method, as it is applied not only in psychology but in every science, lies, not in the gathering of the data, but in the interpretations of the evidence. This opportunity for error, however, is not peculiar to psychology, but is found in any field where diagnosis is involved.

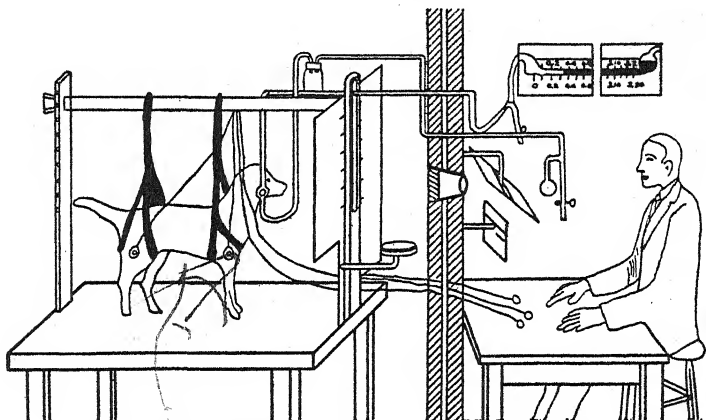
The scientific method can be used in psychology. The most convincing evidence may be found in a description of certain outstanding experiments.

1. *The Conditioned Response.* The first experiment to be described is the investigation of the conditioned salivary reflex by the famous Russian scientist, Pavlov.² We are

¹See Chapter 8.

²Ivan Pavlov: *Lectures on Conditioned Reflexes*. 1928.

all acquainted with the fact that our "mouths water" when we see or smell delicious food, especially if we are suffering from the pangs of hunger. The watering of the mouth is the popular expression to describe the secretion of saliva by the salivary glands which takes place automatically (reflex) upon the presentation of food. Pavlov wanted to ascertain whether certain stimuli which had become connected with food by repeated experience would



CONDITIONING THE SALIVARY REFLEX

(Diagram from Pavlov, *op. cit.*, p. 271. By permission of Oxford University Press.)

likewise cause the flow of saliva. This was his hypothesis. The next step was experimentation.

Pavlov conducted his investigation about 1900 under rigorously scientific conditions. The dog to be studied was placed in a sound-proof room. The experimenter made his observations through peepholes, presented the stimuli by means of controls located outside the room, and employed apparatus to record mechanically the time and amount of salivary secretion. The salivary flow was usually released by feeding the dog powdered meat. The salivary response is an unlearned or unconditioned re-

sponse since no past experience is required for the secretion to occur. Food is spoken of as the adequate stimulus, since it is capable of evoking the response upon the initial presentation. Food "just naturally" made the dog's mouth water. Next Pavlov rang a bell to find out whether the sound of the bell would cause the flow of saliva. No saliva appeared. The bell is referred to as an inadequate stimulus. Next the bell was rung every time the meat was offered to the dog and this procedure was repeated a number of times. Then the bell was rung without the presentation of food, and the saliva flowed. The bell, an inadequate stimulus, had become adequate by association with the adequate stimulus, the food, and the flow of saliva in response to the bell was called a conditioned reflex. Similarly, in our own experience, we find that the sound of the noon whistle starts the secretion of saliva because noontime through long experience has acquired the meaning "meal-time."

Pavlov's experiments confirmed his hypothesis, but unfortunately the conditioned reflex was immediately hailed as the explanation for all behavior, animal and human, whether simple or complex. "Who would have thought that the salivation of one dog in Petrograd would have inspired the . . . comprehensive . . . assurance that there is nothing in all this mental mystery to explain, except a simply conditioned reflex? It isn't men, so much as psychologists, who are fearfully and wonderfully made."¹ It would be more accurate for psychologists to use the term *response* rather than *reflex*, and to restrict the principle of conditioning only to the explanation of the fact that a response to one situation may be conditioned or attached to a new situation. The complexities of association still remain to be accounted for, and they should not be neglected in an adequate explanation of behavior.

¹Joseph Jastrow in the *Forum*, November, 1927.

There is no fault to find with Pavlov's experiment—the errors have crept into the interpretation of his findings and their application to various modes of behavior.

Pavlov's studies of the conditioned reflex in animals furnished Watson with the idea that many of the activities of the human infant which had been attributed to instinct (native equipment) were really conditioned responses. To test his hypothesis, Watson studied the emotional reactions in a boy, Albert, who was eleven months old.¹ Experiment showed that a white rat, a rabbit, a dog, a monkey, and burning newspaper did not evoke fear reactions. Knowing that a loud noise was an adequate stimulus for arousing fear, Watson struck a steel bar just behind his victim. The child started violently, his breathing was checked, and his arms were raised in a characteristic manner. On the second stimulation the same thing occurred, and in addition his lips began to pucker and tremble. On the third stimulation the child broke into a sudden crying fit. Albert was now ready for the conditioning process.

A white rat was presented to Albert. He reached for it without any sign of fear. Just as his hand touched the animal, the bar was struck immediately behind his head. The joint presentation of the two stimuli, rat and noise, was repeated several times and, a week later, several more times, until Albert began to whimper. Finally, the presentation of the rat without the noise was sufficient to evoke crying and other reactions indicative of fear. Thus, by connecting an inadequate stimulus with an adequate stimulus, a fear response had been conditioned in Albert.² Watson was satisfied that he had confirmed experimentally the principle of the conditioned response advanced by Pavlov. The study of Albert was carried on with the

¹J. B. Watson and R. Rayner: "Conditioned Emotional Reactions," *Journal of Experimental Psychology*, 1920, 3, 1-14.

²J. B. Watson: *The Psychological Care of Infant and Child*, p. 26. 1928.

same scientific spirit that pervades any objective investigation among the physical sciences, though some question has since been raised concerning the control of the conditions.¹ Watson's studies have thrown considerable light on child training.²

2. Measurement of Reaction Time. It is a matter of common knowledge that some people respond quickly to stimuli, whereas other people, like the proverbial Englishman responding to a joke, need plenty of time. Repartee has been defined as the knack of saying instantly what you think of tomorrow. Many of us are so slow that our friends never suspect that we are clever.

The scientific study of reaction time grew out of a problem in astronomical observation. At the Greenwich observatory in 1796 an assistant named Kinnebrook differed 8/10 of a second from the royal astronomer, Maskelyne, in his record of the stellar transits. Though Kinnebrook had been warned to improve his accuracy, his "error" persisted, and so Maskelyne, taking his own times as the norm, decided to dismiss Kinnebrook from the observatory. Twenty years later the German astronomer Bessel, after reading about Kinnebrook's case, began to wonder whether trained observers would agree in their astronomical records. He conducted experiments at Königsberg which definitely indicated the fact of individual differences, a fact which came to be known as the personal equation. Wherever subjective measurements are made, the results must be corrected in the light of possible variations among the individuals who are doing the measuring. Bessel's studies stimulated considerable

¹See pp. 328-329.

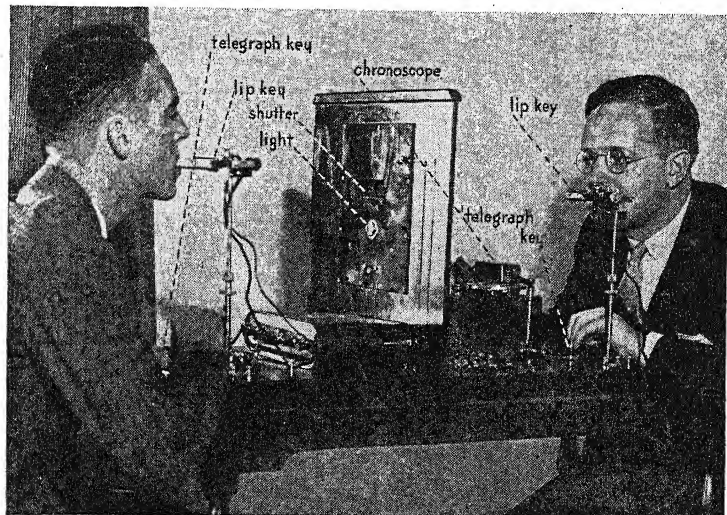
²See pp. 319-330. Motion pictures of Watson's experiments are available under the title of *Experimental Investigation of Babies*. This silent picture, which is of both historical and experimental importance, gives a graphic account of the development of reflexes and instincts in infancy. The film may be procured from the C. H. Stoelting Co., Chicago, Ill. Cost: \$45.

REACTION TIME

1000-1100-1200-1300-1400-1500-1600-1700-1800-1900-2000

interest in the personal equation, and further investigations were made with which we need not concern ourselves here.

In 1840 Wheatstone constructed a chronoscope, an instrument for measuring and recording time. The chrono-



REACTION TIME APPARATUS

The stimulus may be a spoken word registered by the lip key, or a pressure of the telegraph key, or the flashing of the light, or a word exposed momentarily through the shutter. The response may be registered by the lip key or by the telegraph key. Ordinarily, the arrangement of the stimulus and response apparatus would be selected from the above possibilities. For example, the stimulus and response could be spoken words registered by the two lip keys, the chronoscope recording the time interval.

(Photograph by San Roma. Reproduced by permission of Lowell Trowbridge.)

scope has since been perfected so that the investigator can determine the speed of reaction down to one sigma ($1/1000$ of a second). In a typical experiment in reaction time the observer presses a finger key when he perceives the stimulus. The stimulus, the key, and the chronoscope are connected electrically so that the time is accurately recorded. The above photograph depicts a variation

of this experimental set-up for measuring reaction time.

One practical application of reaction time is found in athletics. If a man is slow, he should take up golf where he can take all the time he wants before hitting the ball. It would be an additional help if he has the sort of temperament that allows him to ignore what the golfers behind him are saying about him as they trail him around the course. Baseball, on the other hand, requires quick reactions. The batter has no time to deliberate when the pitcher delivers the ball. Babe Ruth was fast in his reaction time, while Walter Hagen was not so rapid. Each man specialized in the sport for which he was particularly qualified.

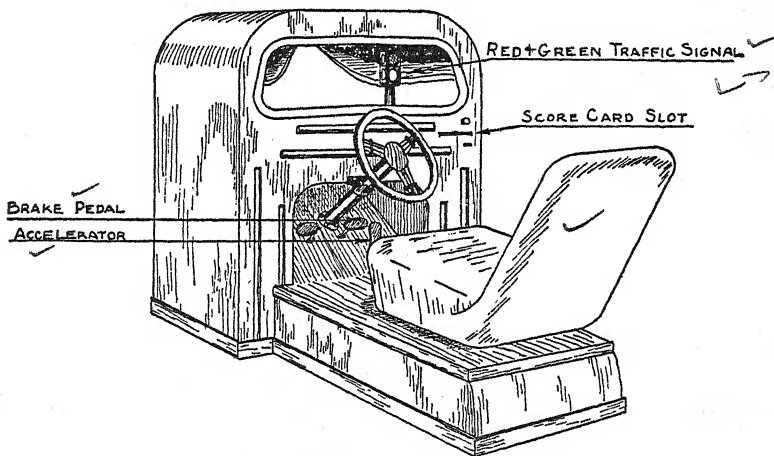
Reaction time is involved as an important factor in accidents. Not long ago an express train left the rails near Mülheim in Baden and fourteen persons were killed. The cause of the accident was the speed with which the train passed over a dangerous structure. The engine-driver had gone to sleep and had, therefore, passed signals without stopping or checking the speed of the train. There was no doubt about the man's guilt. But according to the law in Baden, it was the duty of the conductor likewise to give heed to the signals. When he observed that the driver had passed them without making the slightest alteration in the speed of the train, it was his duty to set the emergency brake. If he had done this at a suitably short interval after the stop signal was passed, the train might still have been saved.

The speed of the train was 110 kilometers (about 68 miles) per hour, and twenty-two seconds were required to cover the distance between the signal at the entrance to this stretch of the road and the point of danger. The government authorities in charge of the case put the following questions to a well-known psychologist, Professor Marbe:

Did the twenty-two seconds give to the conductor sufficient time:

1. To see that the engine-driver was negligent and did not set the brake;
2. To perceive the danger to the train;
3. To remember his duty to take action;
4. To decide to set the emergency brake;
5. To carry out his decision?

Obviously the guilt or innocence of the conductor hung upon the answer to this query. Professor Marbe was able to demonstrate by exact experiment that the performance of these various mental operations required only four



BRAKING REACTION TIME

For several years Dr. H. R. DeSilva has been investigating the braking responses of thousands of individuals. The apparatus illustrated in the accompanying picture consists of a standard automobile seat with steering wheel, accelerator, brake and clutch pedals in their usual positions. In obtaining a braking response the subject is asked to put his foot upon the accelerator. A green light thereupon appears in front of the subject and after an irregular interval, which is mechanically controlled, a red signal light appears. Upon the appearance of the red light, the subject is expected to apply his brake as quickly as possible. A clock measures the time between the appearance of the red light and the removal of the right foot from the accelerator; this is called the sensory reaction time. A second clock measures the total time that elapses between the appearance of the red light and the application of the brake.

(Reproduced by permission of the Yale Institute of Human Relations through the courtesy of Dr. H. R. DeSilva.)

seconds at the utmost; consequently the man's guilt was established and he was duly sentenced.

A battery of tests has been developed to determine the reaction times of the automobile driver. Among them is the Braking Reaction Time Test that measures the time needed for the brain and muscles to respond to an emergency situation, such as that of a car stopping suddenly in front of your own car. (See illustration on page 33.)

The distance a car will go from the time a driver first perceives the danger and the moment he applies his brakes depends upon how quickly he thinks. The quicker he is in his thinking, the less this distance, as shown in the table at the foot of this page.

The braking reaction test measures the time you take to apply the brakes when you see an emergency, but it does not take into account how far the car will go before the brakes bring it to a stop. Assuming that all four brakes are in perfect condition, that the road surface is dry, that the tire treads are not worn and that it takes you only 50/100ths of a second from the time you perceive danger until you apply the brakes, your car will travel the following distance before coming to a stop:

TOTAL DISTANCE REQUIRED FOR STOPPING¹
(Cars equipped with 4-wheel brakes)

Miles per hour	Thinking Distance (i.e., ground traveled while acting to apply brakes)	Vehicle's Slowing Distance	Total Distance Traveled to a Dead Stop
20	15 feet	28 feet	43 feet
30	22 "	62 "	84 "
40	29 "	109 "	138 "
50	37 "	172 "	209 "

¹Quoted from "A Research on Scientific Investigation of Driving Skill," September, 1934, to August, 1935. FERA Project No. XS-F2-U25, H. R. DeSilva, Administrator.

In a further expansion of the preceding table, if a car is traveling 50 miles per hour, it is moving 73.33 feet per second. A matter of 1/10th of a second loss in reaction time means 7.33 feet farther traveled.

DISTANCE TRAVELED AT VARIOUS SPEEDS DURING DIFFERENT BRAKING-REACTION TIMES								
REACTION TIME IN HUNDREDTHS OF A SECOND	SPEED IN MILES PER HOUR							
	20	30	35	40	45	50	60	70
	NUMBER OF FEET TRAVELED BEFORE BRAKES BEGIN TO TAKE EFFECT							
30	9	13	15	18	20	22	26	31
35	10	15	18	21	23	26	31	36
40	12	18	21	23	26	29	35	41
45	13	20	23	26	30	33	40	46
50	15	22	26	29	33	37	44	51
55	16	24	28	32	36	40	48	56
60	18	26	31	35	40	44	53	62
65	19	29	33	38	43	48	57	67
70	21	31	36	41	46	51	62	72
80	23	35	41	47	53	59	70	82
90	26	40	46	53	59	66	79	92
100	29	44	51	59	66	73	88	103

As tested by the Braking Reaction apparatus under standard conditions, the average person's time is 45 hundredths of a second. At a speed of 50 miles per hour, the car travels 37 feet before the brakes begin to halt the car; another 172 feet before the brakes bring the car to a stop; hence the car travels a total distance of 209 feet after the moment when the driver perceives the need for reducing his speed.

The speed of braking reaction is affected by a number of factors. Practice may improve the time by .05 to .10 seconds. If the driver is concentrating his attention on the steering wheel, the time is lengthened by .10 or .15 seconds. Fatigue and excessive indulgence in alcohol slow up the reaction. Elderly people are slower because it takes them longer to move the foot from the accelerator to the brake. Their sensory reaction time, that is, the time between perceiving the signal and moving the foot, is not longer. It is the motion itself that takes longer. Women, on the average, are about 10 per cent slower than men. It is also important to note that a woman exerts about 90 pounds pressure on the brake pedal, as compared with 150 pounds for men. It takes a woman longer, therefore, to bring a car to a stop even after the brakes are applied.

Clinics are being organized to train accident-prone drivers. Persons whose braking reaction time is slow are cautioned to drive more slowly and to refrain from following cars at close range.

Reaction time is complicated by the experimental situation. Ach's experiments show how the instructions of the experimenter may affect the length of the reaction time as determined by a particular procedure.¹ Ach asked his subjects to move the right finger when the letter E was shown and the left when the letter O was exposed. The

¹N. Ach: *Ueber die Willenstätigkeit und das Denken*. 1905.

times required for each movement were measured. Then he instructed the subject to move either finger to either stimulus, and observed that the reaction times were longer since, under the conditions, choice was involved. Under the first instruction the experimenter prescribed the reaction and thereby determined a definite set; under the second instruction the subject was left free to react in accordance with his own choice in the matter.

SUMMARY

Psychology is popularly conceived as an easy technique for winning health, wealth, and wisdom. This pseudo-psychology is widely practiced by quacks. Psychology is also identified with common sense by many persons. It is important for the student to realize that scientific psychology is a discipline very distinct from the pseudo-psychology of the success-mongers, and that scientific psychology transcends the unorganized, inaccurate observations which pass as common sense.

Psychology has gone through a long history. Pre-scientific psychology dealt with the soul in a mystical way and with the mind in a speculative fashion. Modern scientific psychology has two concerns: first, describing experience and behavior; second, formulating the laws that govern experience and behavior. More and more attention is being concentrated on the study of behavior.

We have observed how the scientific method, with its techniques for controlling conditions, has been applied in studies of the conditioned response and of reaction time. These examples of typical studies are selected from a vast number of investigations to illustrate how psychologists have turned to laboratory techniques in an effort to gather observations that will be both accurate and sound.

2

POINTS OF VIEW

THE ESSENTIAL METHOD of psychology, as of other sciences, is observation, for it is only through the systematic assemblage of facts that a scientific insight into human nature can be secured. Since the human being is a very complex creature, it is not strange that a variety of views have been advanced in regard to mental life and its manifestations in behavior. What a psychologist will observe depends, of course, upon what he is looking for. Scientific observation must start, like any other observation, with a particular bias. The adoption of a particular point of view involves the selection of particular phenomena for study.

The subject matter of psychology has been defined as embracing mental activities and overt behavior. The ways of investigating these two kinds of data provide the framework within which a particular systematic point of view is developed. Each school of psychology defines its problems and plans its experiments according to its own unique conception of what psychology is. "A psychological system is an attempt to arrange and coördinate, in a logical and understandable fashion, the facts of the science into a meaningful and satisfying whole. . . ."¹ Each system selects the facts to be observed and to be organized for interpretation. An appreciation of this

¹F. S. Keller: *The Definition of Psychology: An Introduction to Psychological Systems*, p. 106. 1937. Good for a brief résumé of the schools of psychology.

fundamental principle will make it easier to understand how it is that schools come into being.¹

I. OBSERVING THE MIND

The first method of observing the mind is introspection—the immediate inspection of one's own experience. Introspection can only be used to reveal the content of one's own mind.

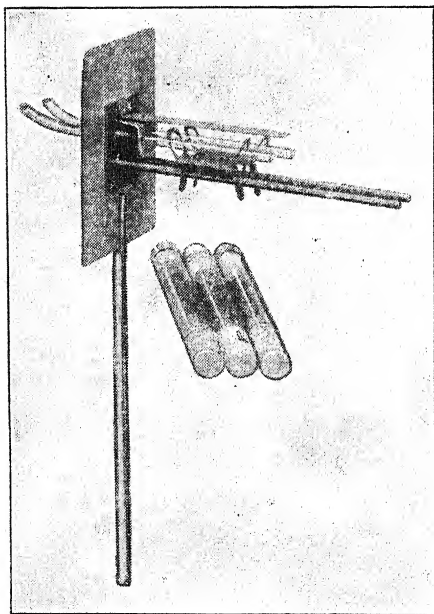
The second method of approaching the mind is to observe behavior, and then to infer what is going on in the mind of the person under observation. This method is used primarily in getting at the mind of another person, since direct observation of the mind of somebody else is impossible.

A. Introspection: The Contents of the Mind. The study of one's own experiences is known as introspection (looking within). The method of introspection is to be distinguished from the kind of observation employed in the physical sciences which we may call inspection (looking at). Introspection as a method of observation is peculiar to the science of psychology, for it is only in psychology that a person is interested in the nature of his own experiences *per se*.

In an introspective experiment the subject, or observer, as he is called, is given the opportunity to watch his own mental states under conditions which are so controlled that they may be repeated, isolated, and varied. Instructions are given in a standardized form and manner to prepare the observer for the presentation of the stimulus. The subject is requested to observe the stimulus, and then to give a full report of his experience. Suppose a bottle of camphor is submitted for him to smell for a minute with

¹For two excellent and more detailed accounts of the schools of psychology, see: E. Heidebreder: *Seven Psychologies*. 1933. R. S. Woodworth: *Contemporary Schools of Psychology*. 1931.

both nostrils. The observer maintains the opening of the bottle in a definite position with respect to his nose, and breathes deeply at a prescribed rate. The introspective report involves a description of the sensations, feelings, and ideas aroused by the stimulus—how the nasal membranes smart, how the sensation fades gradually or suddenly, whether the experience is pleasant, and how his ideas turn to closets and moth balls, and so on.



OLFACTOMETER

An instrument for presenting various odors to a subject for introspective report.

(Reproduced by permission of C. H. Stoelting Company.)

In another type of introspective experiment the subject is given a problem to solve, with the instruction that he is to complete the performance and then to recall the steps taken in carrying out the assignment from start to conclusion. He is thus called upon to report what he has experienced during the period of activity and he is warned in doing so to limit himself carefully to the observed data of consciousness.

An introspective experiment involves one peculiar difficulty in that the subject is at once both the observer and the observed. The person who is observing a chemical reaction can write down a description of what he is seeing during the course of the reaction, but the observer in an introspective experiment finds that the effort to observe interferes with the experience that is being observed. The activity of observation affects the experience under examination. The observer is in a predicament analogous to that of the small girl who stood in front of a mirror with her eyes closed to see how she looked when she was asleep. As soon as the subject observes he tends to substitute the state of mind "look" for the state of mind "smell of camphor," let us say. One way to obviate this difficulty in introspection is to allow the experience to run its course as freely as possible, and then to recall it and describe it from memory, repeating the experiment to check carefully all the data recalled. Introspection is thus carried out by resorting to retrospection; introspective examination becomes *post mortem* examination. Trained observers, however, learn to take mental notes while the observation is in progress without interfering with consciousness. Expert introspection can be achieved only by long training.

Experience may be analyzed into its elements, or it may be described as a whole.

1. Elementarism. One school of psychology prefers the method of analysis, patterning its method upon the analytic approach adopted by investigators in the physical sciences where an understanding of the nature of matter has been gained by breaking matter down into molecules, atoms, electrons, protons, and so on. Titchener, long a professor of psychology at Cornell, was a leading exponent of the view that the best way to understand consciousness is to take it apart and describe it in terms of its elements and the relations among the elements. We may speak

of the Titchenerian viewpoint as "Elementarism," since the primary aim of its introspective method is to analyze consciousness into its elements.

Introspection very naturally adopts the analytic approach to experience just as the physical sciences have employed the method of analysis to ascertain the exact nature of the physical world.

So far, now, as description is concerned, the problem of psychology closely resembles the problem of physics. The psychologist seeks, first of all, to analyze mental experience into its simplest components. He takes a particular consciousness and works over it again and again, phase by phase and process by process, until his analysis can go no further. He is left with certain mental processes which resist analysis, which are absolutely simple in nature, which cannot be reduced, even in part, to other processes.¹

In another passage, Titchener outlines his method:

What have we to do, in order to get a scientific description of mind? We must do what everybody does who begins to describe; we must take things piecemeal. When you are away at the seaside, and are describing your room in a letter home, you tell of exposure and windows and carpets and furniture and pictures; you break up the room into parts, and list them one by one; but you do not list at haphazard; you bring your items into such connection as will make it easy for your readers to reconstruct the room. The man of science does the same sort of thing; he analyzes, and all the while he is analyzing he has his eyes open for relations, for putting his elements together again as they belong. . . . The mental world, no less than the material, comes to us in the gross; mental phenomena are complex, often highly complex; we must reduce them to their elements, we must keep analyzing until we can analyze no further, if we are to describe them in a scientific way.²

¹E. B. Titchener: *A Textbook of Psychology*, pp. 37-38. 1910. By permission of The Macmillan Company.

²E. B. Titchener: *A Beginner's Psychology*, pp. 15-16. 1917. By permission of The Macmillan Company.

According to Titchener, the elements of consciousness are *sensations*, *images*, and *affections*. Sensations are familiar to everyone, in the perception of stimuli—the sensation of a bright red, or a dull pressure on the finger tip. Images are the “mental pictures” involved in the memory of past experiences, or in the anticipation of the future. They are the elements of our ideas. Affections constitute the elements of our emotional life, such as love, fear, and anger.

Sensations have a number of attributes: *quality*, *intensity*, *duration*, and *clearness*. The quality of a sensation is its distinctive attribute: yellow, hot, bitter. Intensity is the attribute described by such terms as stronger, louder, and brighter. Duration is the attribute which has reference to the course of a sensation with respect to time. Sensations may appear, fade, and reappear in successive moments, with the stimulus constantly present. The clearness of an experience is its vividness in consciousness.¹

In Titchener's system, sensation was regarded as an elementary process. Rahn suggested a very apt criticism when he pointed out that sensation could not be an element since it was further analyzable into its attributes.² The attribute, therefore, should be regarded as the simplest mental process instead of the sensation. Experimental evidence supports Rahn's contention by showing that the attributes are independently variable. For example, consider a certain tone, say of 256 vibrations (quality of middle C) and of a certain intensity. The same tone (quality) may be experienced even though the intensity is altered and, in the same manner, a different tone (quality) may be perceived though the intensity remain

¹E. G. Boring: *The Physical Dimensions of Consciousness*. 1933.

²C. Rahn: *The Relation of Sensation to Other Categories in Psychology: A Study in the Psychology of Thinking*. 1913.

the same. The attributes, being independently variable, should be regarded as elementary, or at least as more elementary than sensations.

In our everyday experience we do not have bare sensations, since ordinarily the things we perceive have meaning for us. The meaning given to a sensation will depend on the situation in which the organism finds itself. Thus the context determines the meaning.¹ The smell of gunpowder on the Fourth of July is likely to mean "fire-crackers"; in the woods on a fall day, "hunters"; in a shooting gallery, "another shot at the target." How are these meanings brought about? What, introspectively, is meaning?

Meaning, for Titchener, was the result of bringing past experience to bear upon present experience in such a way that images accrue to a central group or core of sensations or images. Thus the core of gustatory sensations and images produced by a bite of a certain sandwich filling may evoke a fringe of images which permits the identification of the food as deviled ham. Additional images may bring back memories of picnic lunches at the seashore. The filling becomes more meaningful as further images of friends and old times come into consciousness, as context accrues to the core through associations.

Titchener aimed to strip sensations of their meanings in order to discover the sensory qualities in their "pure" form, since he felt that "mental processes do not intrinsically *mean*."² An experience should be described in terms of its quality, intensity, clearness, and duration. Meaning is ruled out because it is not an elementary mental process. Suppose several persons are looking at a small sheet of red paper on a gray background.

¹See E. B. Titchener: *A Textbook of Psychology*, pp. 367-373. 1910. The Macmillan Company.

²E. B. Titchener: *A Beginner's Psychology*, p. 30. 1917. The Macmillan Company.

The printer might describe the texture of the paper and shade of the ink and the physicist might describe the color as standing nearer one point in the physical spectrum than another; the housewife might describe the color as a good or bad color for a dress or for house decoration, but the mentalist insists that he takes redness, the relatively simple ongoing conscious process which we name as "redness" and describes it, not as a part of the spectrum or as a part of a dress or as a product of printer's ink, but describes it for its own sake. He says that it has or is a certain hue (or color quality), it has or is a certain tint (light or dark), it has or is a certain richness (or chroma), it has or is a certain clearness (it is or is not the clearest among the many processes that may be in the stream of consciousness at the particular moment), and so on.¹

Titchener defined psychology as the science of mind, and stated the problem of psychology as the analysis of mental phenomena into their elements. The school of psychologists which he represented has been known as "Structuralism," though "Elementarism" seems to be more accurately descriptive of their introspective investigations. Titchener himself, toward the end of his career, preferred to be called an "Existentialist" because, he said, the world of mental process or "bare existence is the only world science can know."

2. Configurationism. Another school of psychology emphasizing the introspective technique, though not limiting itself to this method, as did the Titchenerians, is "Configurationism." The best critique of Titchener's introspective psychology is to be found in the works of Köhler² and Koffka³ who belong to the school of *Gestalt Psychology*, known in America as Configurationism.⁴

¹C. R. Griffith: *A General Introduction to Psychology*, p. 85. 1928. By permission of The Macmillan Company.

²See W. Köhler: *The Mentality of Apes*. 1925. Also: *Gestalt Psychology*. 1929.

³K. Koffka: *The Growth of the Mind*. 1924.

⁴The noun *Gestalt* has two meanings: it connotes "shape" or "form," or a thing having a shape or form as one of its attributes.

Thus, any structure, such as a four-leaf clover, may be said to be a *Gestalt*, in that it possesses form.

Titchener analyzed consciousness to describe the elements of which it is composed; the *Gestalt* psychologists examined consciousness as it comes to the naïve, unpracticed observer and they found experience comes in meaningful structures or forms rather than in meaningless pieces—the parts are there but they belong to wholes. The Configurationists point out that the characteristics of a part are influenced by the total pattern (configuration) to which the part belongs.

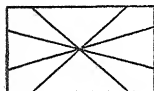


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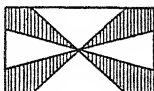
The *Gestalt* psychologists emphasize the fact of organization in experience. The whole, say the Configurationists, is prior to the parts in experience. A two-year-old child will not recognize a picture of his mother's nose because his mother's nose is not a separate item to him, but an integral part of her face. Her nose is not a nose but a nose-on-a-face. I remember a game which afforded considerable amusement to a group of married couples who were being entertained by a professor. The women all retired to a separate room. One woman at a time, so well concealed behind a portière as to be *incognita*, extended one of her hands to be examined by the men. Each man was to judge whether the particular hand belonged to his wife. Considerable confusion reigned when the men revealed the wildness of their guesswork. Some of the errors, I suspect, later incurred the rebukes they deserved from embarrassed and humiliated wives. The men should hardly be given much credit as far as intelligence is concerned for exposing themselves to such a dangerous ordeal, but they should, of course, have been pardoned for their

mistakes in identification, since a woman's hand belongs to a woman and is not just a hand. A hand is a part, it is true, but a *part of the whole woman*.

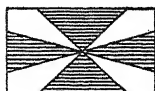
To what whole a part belongs, depends upon the process of grouping which is an inherent aspect of the perceptual process. The figure below may be seen in various arrangements of the parts.¹



It may be
seen as



or



On one occasion, assigning a part to a wrong whole resulted in an amusing incident for radio listeners.

Stein Song Not a Part of W.C.T.U. Program

Those persons who tuned in on station WNAC Wednesday to hear the W.C.T.U. radio forum and thought that the program was opened by the stirring strains of the Stein Song of the University of Maine, should have their watches adjusted, because they really tuned in ahead of time. They heard the Stein Song all right, but it was the closing number of the Berry Spring Mineral Water Company entertainers. The dry broadcast started at the scheduled time—3:45 P.M.—and was an all-speaking program.²

The whole, says the *Gestalt* psychologist, is more than the sum of its parts. Take four lines



¹From W. Köhler: *Gestalt Psychology*. The representations of the variations are mine. By permission of Liveright Publishing Corporation. 1929.

See also Gardner Murphy: "The Geometry of Mind," *Harper's Magazine*, October, 1931.

²The Boston *Herald*, April 18, 1930.

and arrange them in a particular relationship and there has evolved the form-quality of squareness which does



not exist in any of the four lines. Squareness only appears when the parts are related to each other in a certain structure. A still better illustration is found in a melody. The melody does not depend upon the parts but upon the structure, for the parts may all be changed by transposing to another key, and yet the melody remains intact. The parts have all been altered, the whole is still the same. If a note is sung flat or sharp, the musical listener immediately detects the fault, since the tone is not merely a tone but a tone in a melody, deriving its properties, to some degree, from the whole to which it belongs.



CLOSURE

(Drawn by R. Wilson Hammell.)



"They are on the deck of our new camouflaged ship!"

(Reproduced through the courtesy of *Collier's* and by permission of the artist, Mr. Bandel Linn.)

configuration

If you alter any one part, you change the whole. Suppose you furnish a living room with a suite fitted with reversible cushions. If you reverse one cushion, you alter the whole room.

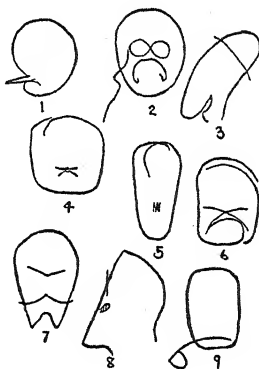
An interesting phenomenon involving the part-whole relationship is the process of *closure*: given a part of a familiar whole, the individual completes the structure himself. Artists employ this principle, leaving out certain lines which the observer is to fill in, unconsciously, for himself. (See the illustrations on page 48.)

The caricaturist, in the following drawings of famous personages, has supplied the observer with the barest essentials as a basis for completion and yet most of them are easily recognized.

PARTIAL IDENTITY

Celebrated faces—Can you identify them? 1. "Cal" Coolidge. 2. "Teddy" Roosevelt. 3. "Al" Smith. 4. Herbert Hoover. 5. Hitler. 6. Hugh Johnson. 7. Charles E. Hughes. 8. Franklin D. Roosevelt. 9. Charles G. Dawes.

(Reproduced through the courtesy of *Vanity Fair*. The Condé Nast Publications, Inc.)

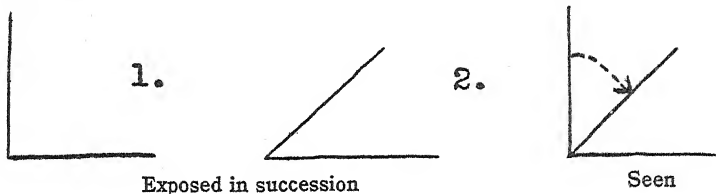


The same process of closure, by which the observer makes subjective additions to the figures, occurs in seen movement—what the Configurationists call the *phi phenomenon*.¹ By means of a tachistoscope,² angles 1. and 2. on page 50 are successively exposed to view at intervals of about 60 sigma (60/1000 of a second). There is a discrete displacement actually; that is, the two views are separate, but the observer sees the lines move from position 1 to position 2. The phenomenon of movement is appreciated still more clearly if human figures are exposed in a situa-

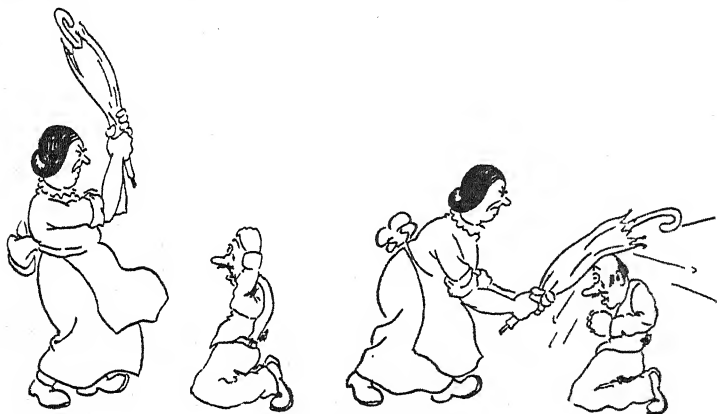
¹See H. R. De Silva: "An Experimental Investigation of the Determinants of Apparent Visual Movement," *American Journal of Psychology*, 1926, 37, 469-501.

²An apparatus for exposing stimuli for a very brief duration.

tion calling for motion, such as a person hammering a nail, or a woman hammering her husband. Closure is the basis



for the apprehension of the stroboscopic movements involved in motion pictures, where a series of discrete "stills" is exposed so rapidly as to produce an illusion of motion.¹



(Drawn by Earl Wilder)

Patterns of verbal expression become so standardized by usage that it is often possible to predict from the opening words of a stereotyped phrase just what the closing words are to be. "Hello" evokes "Hello," and "How are you?" provokes the inevitable "Fine, thank you." Resort to clichés makes it easy to follow the trend of conversation. Test yourself on the following clichés. Cover the right-hand column with a piece of paper, read the

¹Stroboscopic movement in vision is the illusion of motion produced by a series of pictures viewed in rapid succession.

opening words on the left, complete them in your own mind, and then drop the piece of paper one line to check on your answer.

CLICHÉ TEST

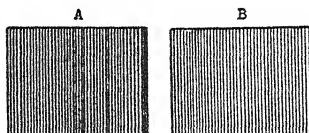
Fine and	DANDY
Time and	TIDE
Wrack and	RUIN
Flesh and	BLOOD
Nip and	TUCK
Straight and	NARROW
Clear as	CRYSTAL
Fresh as a	DAISY
Regular as	CLOCKWORK
Dead as a	DOORNAIL
Sober as a	JUDGE
Brown as a	BERRY
Fit as a	FIDDLE
Bed of	ROSES
Root of	ALL EVIL
Nick of	TIME
Heart of	GOLD
Pretty kettle of	FISH
Turn over	A NEW LEAF
Keep a stiff	UPPER LIP
Face the	MUSIC
Let the cat	OUT OF THE BAG
Take the bull	BY THE HORNS
Put your shoulder	TO THE WHEEL
Spill the	BEANS

The principle of closure is just as applicable to explicit as to implicit behavior. The pursuit of a goal may be described as a progression from preparatory to consummatory responses, in Woodworth's terms, or as a progression from non-closure to closure, in *Gestalt* terms.¹ Just as the dominant seventh chord alone or in a harmonic progres-

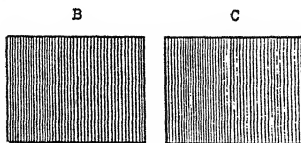
¹See R. S. Woodworth: *Psychology*. Third edition, 1934.
For the Gestalt point of view, see R. H. Wheeler: *The Science of Psychology*. 1929.

sion leaves the hearer with a feeling of incompleteness which can only be relieved by proceeding to some form of the tonic chord of the same key, so the hunger pattern involves a tension that can only be pacified by the consumption of a square meal. The Configurationists, as has been said before, do not confine themselves, by any means, to introspection.

When a person learns to behave in response to certain stimuli, it is not to the separate stimuli but to structures that the individual is reacting, since experience is pattern-wise. Suppose a chimpanzee or a three-year-old child is presented two stimuli



one of which is a dark gray and the other a lighter gray. The subjects are taught to go to "B" by a conditioning process—being rewarded when they go to "B" and punished when they go to "A." To make sure that the subjects are not going to the right-hand stimulus in preference to the left, "B" is sometimes presented to the left of "A." The subjects apparently have learned to go to "B"—they have contracted the "B" habit, so to speak. When "B" is presented with another stimulus "C" (a still lighter gray than "B"),



they should go to "B." Do they? No. The subjects go to "C." The experiment demonstrates that the chimpanzee and the child did not learn to go to "B," but to go

to the lighter gray. "B" was simply, from the experiential point of view, the lighter gray in a structure in which it was related to the darker gray "A." It was to the whole rather than to the parts that the subjects were reacting. So when "B" and "C" were exposed, "C" was chosen as the lighter gray in the new structure. The behavior in this experiment is good evidence that experience comes in wholes, in structures, in *Gestalten*.

The *Gestalt* psychologists do not object to the method of analysis as such, but they do protest against the assertion that the elements constitute the essence of experience. There are parts to experience but they are parts subordinated to a whole, and when experience is observed naïvely (naturally), it is structures and not elements that are noted. Analysis is a justifiable procedure but it is not the only method of scientific psychology. The psychologist who has observed only the elements has ignored a very important aspect of his experience—and that is the fact that the elements *belong together* in a pattern. The controversy between Titchener and the Configurationists can be reconciled, it seems to me, in terms of attitude. If you assume the analytic attitude in introspection, you can describe the elements of experience. If you assume the naïve attitude of everyday experience, you will get a total impression of patterns. Each method of observation is *equally scientific*. Experience must be complex in order to be analyzed. The error in analytic introspection has been committed by the observer who forgets, after analysis, the whole which he has been picking to pieces. Take experience as it comes in wholes (*Gestalt*), or take it as it comes in wholes and analyze it into its constituent elements (*Elementarism*)—either method is legitimate—both methods are necessary to an adequate psychology.

This account of Configurationism is not intended to be an exhaustive exposition of *Gestalt* principles. We have

emphasized the investigation of perceptual experience because it is in that field that their best introspective work has been done.¹ Our brief presentation of Configurationism is primarily intended to show how the *Gestalt* approach to introspection differs from that of Titchener.

3. *Criticism.* The introspective approach to the study of the mind is subject to a number of limitations. The interference of the introspective attitude with the course of consciousness has already been mentioned. Other limitations of the method are equally serious.

a. *Privacy of Consciousness.* Since consciousness is a strictly private affair, your introspection must of necessity be limited to a direct examination of your own conscious processes. The privacy of mental life is illustrated in the story of the young boy who was observed in the act of scratching himself. A gentleman who was witnessing the performance could not restrain his curiosity. "Johnnie," he asked, "why are you scratching yourself?" "Because," the youth replied, "no one knows better than I do where I itch." The scope of introspective psychology is limited considerably by what we might call the individuality of experience—each one of us is the sole judge, as far as consciousness is concerned, of where he itches. "An introspector," as Marston points out, "can only describe one experience in terms of another and the result is pretty nearly meaningless to everybody else."²

Science depends upon knowledge which can be validated by common agreement among investigators. Introspection being a private affair, how can a scientific psychology be established on the basis of personal beliefs and individual opinions promulgated through introspective reports? How can the private experience of one person be

¹See Willis D. Ellis: *A Source Book of Gestalt Psychology*. 1938.

²W. M. Marston: "New Clues to the Oldest Mystery," *Esquire*, October, 1936.

checked against the private experience of another? Can there be any common ground for validation of private impressions?

There are reasonable grounds for inferring that other human beings have experiences of the same nature as are immediately known to you. One basis for inference is similarity of physical structure. Since we all have the same type of nervous system, it is safe to assume that the mental life which is dependent in some way upon the nervous system is uniform in its character, as well. Human minds tend to resemble each other precisely as human bodies do. Another ground of inference is the uniformity of behavior. The fact that human beings act more or less similarly in adjusting themselves to environmental stimuli, justifies the observer in drawing the conclusion, within the limits of probability, that the minds which are manifesting themselves in action are also akin. The development of language bears witness to the kinship of other minds with whom experiences can be shared. A number of observers, in describing their experiences in a given situation, will be in fundamental agreement. The more data collected, of course, the more exact will be the results. Thus, in spite of the difficulties involved in the private nature of consciousness, a reasonably accurate science of psychology may be established through the introspective method by testing one man's experience with that of others. You cannot probe another's consciousness directly, but you can infer with some certainty that there is something going on in his mind closely similar to the experience you undergo under like conditions.

b. Inadequacy of Language. Another serious drawback to introspective psychology is the inadequacy of language as a medium of description. Introspective reports must be verbal. Of course, most reports, introspective or otherwise, must be verbal. We are more accustomed, however,

to describing behavior in others than we are to delineating our own experiences.

Anybody who has tried to describe his own experiences under experimental conditions comes to realize the paucity of terms for rendering an accurate account of his feelings, images, and sensations. Try to describe the taste of grapefruit or the smell of iodine, and you will be convinced that there are no words to express exactly what you want to say. When a trained psychologist is asked to describe the states of pleasantness and unpleasantness, and the best he can do is to say that pleasantness is a "bright pressure" and unpleasantness a "dull pressure," you readily understand what I mean. Take an experiment. Two figures, \perp and \angle , are exposed in rapid succession. Expert observers offer the following introspections:

ZE characterized the experience of movement, that is to say, what was taking place in the arc of movement, as a "change in brightness, change of intensity. Something seems to happen there. Not black and not white. Like heat rising on a hot day from the pavement. But we can usually see heat waves better. This thing is much faster and more elusive." Upon being asked if he had anything more to say about the nature of the movement he remarked that "it was very difficult to see and much more difficult to describe."

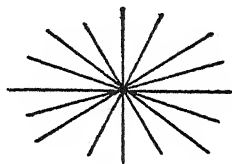
CP adopted an analytical attitude of his own accord and gives us a much completer report: "I can only describe the movement by analogy. The pure movement has an appearance more of an imaginal type. Something more like the trail of a match in the dark. I can't follow the movement of the line through space. I can get something in terms of imagery, a fuzzy sort of thing that comes in the arc of the movement. It is different from the blackness of the line. It isn't as black and as 'clear-cut.'" Later on: "A kind of blurring after-effect." CP also remarked upon the extraordinary difficulty of ever being able properly to get at it descriptively. He seemed to think of the actual stimulus as being almost beyond the ability of the sense-organs and the perceptive process to grasp.¹

¹H. R. De Silva: *loc. cit.*

It is the vagueness of such introspective reports which has prompted some psychologists to discard all reference to consciousness.

c. Incapacity for Self-observation. The chief limitation upon the method of introspection is the natural incapacity for self-observation. Not only is language inadequate as a medium of description, but the actual observation, aside from the report, is inexpert even in the most capable observers.

Recall, for example, the sort of vagueness that seizes you when an optometrist tells you to stare at a chart and state which diagonal appears darkest to you. You don't know but you tell him something for fear of appearing stupid, and then he makes you some lenses you can hardly see through. The doctor who begs you to say where you feel a pain when he pushes on you is distressed at your introspective ineptness. The young man who pursues the elusive maiden for an answer, finds her "torn by a tumult of contrary emotions," so that she must confess she "doesn't know her mind" and can only reply, "Yes and No."



Personality tests which require a self-estimate demand a more expert introspective capacity than the average person possesses. Consider, for example, the following questions.¹

1. Do I get discouraged rather easily, and have moods and occasional fits of depression? Yes No
2. Am I cool and self-possessed in emergencies? Yes No
3. Am I inclined to being very positive, irritable, and dogmatic when I am arguing a question against strong opposition? Yes No
4. Is solitude or being alone enjoyable to me? Yes No

¹J. G. Frederick: *What Is Your Emotional Age? A Book of 65 Amusing Psychological Tests.* Business Bourse, New York, 1928.

5. Do I often say things which I later regret? Yes No
6. Are my relations with my family peaceful and sweet?
Yes No
7. Do I frequently take offence at the words or actions of others? Yes No
8. Do I readily admit I am wrong when I know I am wrong?
Yes No
9. Is it my idea that I haven't had a very good "break" from life? Yes No
10. Am I frequently looking for sympathy from others? Yes
No

Think over the questions and underline either "Yes" or "No." Does the self-analysis bring home to you the difficulty of accurate introspection?¹

The seriousness of the criticisms leveled against the introspective method does not invalidate that method when it is properly employed under controlled conditions and when the results are interpreted with due respect for chances of inaccuracy. Valuable data are being secured through introspection in psychology, psychiatry, and other fields. Nevertheless, modern psychologists, wary of the pitfalls involved in the technique, are turning more and more in their researches to objective methods, that is, to the observation of explicit behavior.

B. Introspection Plus Observation of Behavior—Activities of the Mind and Body. Another group of psychologists are definitely committed in their interest to a study of the individual in action. They center their attention in introspecting upon what the mind is doing, but they rely less on introspection and more on the observation of objective behavior which is regarded as the manifestation of mind. Psychology thus adopts a dynamic point of view.

Inasmuch as psychology is concerned with activities, its

¹For a worth-while, brief discussion of the difficulties involved in this sort of self-analysis or introspection, see R. Stagner: *Psychology of Personality*, pp. 30-31. 1937.

terms should be predominantly verbs and adverbs. One noun, individual, is essential as the subject for the verbs. The use of nouns to represent the activities of the subject is confusing. Intelligence, memory, attention should be thought of as verbs and not nouns. Accurately speaking, the individual behaves intelligently, he remembers well, he sees the stimulus clearly. Such a description is more exact than to state that the person has a superior intelligence, that he has a good memory, that he is blessed with a well-trained attention, since the employment of nouns encourages the student to forget that he is observing, not things, but activities. In keeping with this suggestion, to stress activity by the use of verbs, subsequent chapter titles are called "Attending and Perceiving," "Remembering and Anticipating," instead of "Attention," "Perception," "Memory," and "Imagination," the usage in some older textbooks.¹

1. Functionalism. The Functional psychologist is interested in the activities of the mind. It is mental activity which has immediate significance for thought and conduct. A simple situation will illustrate the difference between the Introspectionist and the Functionalist. Something begins to crawl down the psychologist's back—the Introspectionist lets it continue to crawl and describes his sensations—the Functionalist faces the situation as a problem and figures out what he should do by way of solving it. For the Functionalist consciousness is not an item to be described but an instrument to be used. The task of psychology is not simply to describe, but to investigate the relation of consciousness to behavior and the interpretation of consciousness from the standpoint of behavior. Mind is in the last analysis action—the action of human beings adjusting themselves to their environment. Mind as a manifestation of life is essentially an activity. Mind

¹See R. S. Woodworth: *Psychology*, pp. 29-30. Revised edition, 1934.

and behavior are inseparable processes in effecting an adjustment between the organism and its environment. Some of this action we call thinking, some we call feeling, some we call skill.

Functionalism grew out of the influence of Darwin upon psychology. It developed also as a movement in revolt against the sterilities of the Titchenerian emphasis upon introspection. Its chief exponents in the early stages were James, Dewey, and Angell.¹ The fundamental question which they proposed to answer was: what is the biological function of mind? The function of consciousness is to solve the problems involved in adapting the organism to its environment. Mind is to be defined in terms of its use. Mind is an instrument by which the organism adjusts itself to the complex variations of the environment. Thus the mental life is treated in terms of its evolutionary value.

Psychology, from the Functional point of view, is a biological science. The biological significance of consciousness is its value in securing adaptation to novel situations. When a conflict, a crisis, an emergency, a new situation arises, consciousness steps in to effect a new and better adjustment—to help the individual in accommodating himself to the changing demands of the environment in the most efficient way. After the individual has repeated the new mode of adaptation in response to the recurring situation, consciousness steps out and habit takes care of the behavior. Thus the individual is permitted to make progress in his adjustments, for while habit operates to handle old problems, the person's full attention may be turned to the solution of further emergencies.

A few examples will illustrate how economy of effort is

¹See especially J. R. Angell: *Psychology*. 1908.

For a more modern Functional treatment of psychology, see Harvey Carr: *Psychology*. 1925.

secured through the formation of appropriate habits. A child who is learning how to write must concentrate upon the proper formation of the letters. The story he is trying to tell must remain subordinate until he has mastered the mechanics of penmanship. Once his hands are trained to work automatically he can give his whole attention to the task of narration. Later in life he may decide to compose his themes on a typewriter and again he must practice the manipulation of the keys until the manual operations involved in typing become "second nature." Then he can forget his hands while he concentrates upon the process of composition.

Functionalism has been especially fruitful in the field of education. Education is the process through which appropriate habits are formed. The individual who is properly educated has such a command of the ordinary situations of life that he can devote his entire attention to the more complex problems that baffle human endeavor. Dewey, especially, has emphasized the importance of habit formation in the educative process.¹ educat

Functional psychology is dynamic. In describing the activities of the mind, it deals with impulses, desires, drives, instincts, feelings. It is a purposive psychology in that it considers the mind as working toward the goal of adjustment. The pursuance of future ends and the choice of means for their attainment are the fundamental activities of the mind. Consciousness, according to James, is a fighter for ends.² Functionalism is very close to the viewpoint of Hormism which we shall now consider. // Function

2. Hormism.³ Hormic psychology stresses the conative (striving) aspect of mind. Mental life is interpreted

¹See John Dewey: *Human Nature and Conduct*. 1922.

²William James: *Principles of Psychology*. 1890.

³The word "hormic" is from the Greek word *horme*, which means a vital impulse or urge to action.

in terms of energy (vitalism¹) which is directed toward the attainment of certain goals. The Hormic approach to human nature is thus dynamic and purposive (teleological²). McDougall is a prominent exponent of the Hormic, purposive view of mind; the psychoanalysts, Freud and Jung, with their conceptions of the libido, and Adler, with his theory concerning the quest for superiority, adopt a scheme for interpreting mental life, likewise Hormic in its fundamentals.

McDougall takes purposive striving as his fundamental category. Human nature is described in terms of impulses, propensities, or dispositions which require for their satisfaction the achievement of definite ends. The motive behind behavior is always some instinctive urge, which may be conveniently defined as an innate propensity to seek a certain goal—for instance, the sex urge, which impels a person to seek a mate. The instincts, for McDougall, are the prime movers of all human activity, initiating and sustaining thought and action. The highly developed processes of the human mind are instrumental in devising the most adequate means for attaining the ends which bring satisfaction to instinctive cravings; reasoning, for example, is the servant of instinct, and, as such, functions as a guide to striving—the motivating force, in all cases, being an innate urge to achieve some particular sort of goal.

Wherever we find that behavior is varied in its striving toward some end, there we have evidence of that capacity for purposive adaptation which is the essential function of mind. Purposive behavior is directed toward the realization of some end anticipated by the individual. In so far

¹Vitalism posits a force which is characteristic of living creatures. Hans Driesch and Henri Bergson are outstanding vitalists.

²Teleological is from the Greek word *telos* which means "end" or "goal."

The teleological interpretation of behavior deals with activities in terms of the ends toward which striving is directed.

as behavior is teleological, it may be regarded as an expression of mind.

The psychoanalysts, Freud and Jung, may be classified in the Hormic school.¹ Freud describes the mental life in terms of *libido*, a concept which represents the driving force of the sex instinct.² Psychology for Freud is mainly unconscious, in contrast to the Introspectionists who consider psychology in terms of consciousness. The libido is like the oil in a well—you only see its manifestations as it spouts to the surface to express itself through normal love, or, perhaps, through abnormal interest, on the part of the unwedded, in marriages, births, and scandals.

Mental phenomena are interpreted in terms of energy. Instead of stating that a boy becomes attached to his mother, the Freudian says his libido becomes fixated upon the mother object (the Oedipus complex). When the son grows up and the time comes for him to select a mate, he cannot find one who suits him because his libido is still fixated on his mother, and he cannot release it from her and transfer it to a sweetheart. A girl may be enamored of her father in the same way (the Electra complex)—she cannot find a man like dear old Dad. If a girl who is thus attached emotionally to her father does marry a man approximating her ideal, she may be so disappointed in the shortcomings of her husband that an occasional return to Father may be necessary to sustain her morale. Her libido, in such cases, regresses (goes back) to its earlier object (the father)—it regresses to the point of fixation. The stronger the fixation, the more pronounced the regression.

Jung likewise interprets mental life in terms of a hypo-

¹Strictly speaking, Freud is a psychoanalyst and Jung is an analytic psychologist. Adler is an individual psychologist. Jung and Adler, once disciples of Freud, are eager to distinguish themselves from their former master.

²Sigmund Freud: *A General Introduction to Psychoanalysis*. Thirteenth edition, 1924.

thetical fundamental striving which he designates *libido*.¹ The word *interest*, as Jung suggests, might be a psychological equivalent for libido. Jung's view differs from Freud's in that Jung thinks of the libido as including more than the sexual urge; for Jung the libido is the life energy manifesting itself in nutrition, growth, sexuality, and all the human activities and interests. Freud, in treating a patient suffering from mental disorder, looks for a maladjustment in the sex life; Jung searches the individual's character over a wider range to discover whether he is satisfied in his love life, whether he is contented with his job, whether he has won the esteem of his fellowmen.

Jung, like Freud, describes at length the mechanisms of fixation and regression. The contribution for which Jung is probably best known is his description of the mechanisms of extroversion and introversion.² An extrovert is a person whose libido is turned outward—he is interested chiefly in the external world—he is the doer, the hustler, the mixer, the Behaviorist. An introvert is one whose libido is turned inward—he is interested in his own states of mind—he is the thinker, the poet, the philosopher, the Introspectionist.³

Adler's psychology is thoroughly purposive. Every psychic phenomenon is a preparation for the attainment of some end. "We cannot think, feel, will, or act without the perception of some goal."⁴ Each individual seeks to compensate for feelings of inferiority in his own peculiar

¹C. G. Jung: *Collected Papers on Analytical Psychology*. 1922.

²See C. G. Jung: *Psychological Types; or the Psychology of Individuation*. 1923.

³Jung classifies extroverts and introverts with reference to the psychological functions of thinking, feeling, sensation, and intuition. We need not concern ourselves here with these complicated variations of the two general types. It should be remarked, in this connection, that oversimplified expositions of Jung's types have led many students to believe, erroneously, that Jung would "categorize" people in neat pigeonholes.

⁴Alfred Adler: *Individual Psychology*, p. 3. 1924.

way, setting up for himself, consciously or unconsciously, a goal by means of which he can demonstrate to himself and others the fact that he is superior. The sense of inferiority, which underlies the drive for compensation, may be based on organic inferiority. The unwanted child and the spoiled child are also very much inclined to develop an "inferiority complex."

The end determines the whole style of life which is so characteristic of each person. The neurotic individual compensates for his deficiencies in a useless way, such as daydreaming of remarkable achievements, or in an anti-social manner, such as cultivating the bravado of the criminal desperado.¹ The normal person, on the other hand, compensates for his inferiorities by resorting to useful corrections, such as acquiring a better education or joining a religious group interested in the higher things of life where worldly failures are discounted in favor of spiritual attainments. It is important, Adler insists, to develop social interest in people so that they will be inclined to useful forms of compensatory endeavor.

Everyone, according to Adler, wants to be a man. This desire for manliness, for power, constitutes the masculine protest. Girls who are envious of boys may act like "tomboys," or women jealous of man's prerogatives may become crusading feminists. Men want to be red-blooded "he-men," to be strong and virile like the athlete, or to be brave like the soldier marching forth to war. The masculine protest may develop in a minister's son who feels that he is apt to be considered a mollicoddle, and, therefore, goes the way to perdition to prove, in accordance with his immature notion, that he is a real man.

The goal of manliness, of superiority, may be attained in various ways. Each person attempts to find his own means for satisfying the urge for distinction. The pattern

¹Alfred Adler: *The Neurotic Constitution*. 1921.

of life becomes comprehensible only when the nature of the goal is discovered. Establishing the right aims and guiding the search for their attainment into useful channels is the paramount task of education.¹

The mind is described in terms of its activities by the Functional and Hormic schools. It is an easy transition to the next approach to psychology, Behaviorism, which deals, not with the activities of the mind, but with the activities of the physical organism.

II. OBSERVING BEHAVIOR OF THE ORGANISM

We have dealt with the mind as content and with the mind as activity—we now come to a psychology which leaves the mind out of account and concentrates its whole attention upon the behavior of the organism.²

Behaviorism. In 1903, John B. Watson made a study at the University of Chicago of the white rat in a maze.³ His researches on the rat, and later, on the noddy tern, raised the whole subject of animal experimentation to a new technical level. In the course of his investigations in animal psychology, Watson ran head-on into a puzzling problem. It had been the custom among psychologists to try to reconstruct the consciousness of the animal from the evidence of his behavior.⁴ What is going

¹Alfred Adler: *Understanding Human Nature*. 1927. Also *What Life Should Mean to You*. 1931.

²It should be stated that in our account of Behaviorism we shall deal primarily with the Watsonian variety.

³J. B. Watson: "Kinæsthetic and Organic Sensation: Their Role in the Reactions of the White Rat to the Maze." *Psychological Monographs*, 1907, 8, No. 2.

⁴Anthropomorphic accounts of animals were related by Romanes, who employed the anecdotal method without much regard for scientific caution in his *Animal Intelligence* (1884). Many of his stories attributed human characteristics to the animals he mentioned. This anthropomorphic tendency was attacked by Jacques Loeb, who explained animal behavior in mechanical terms—*Der Heliotropismus der Tiere und sein Ueberstimmung mit dem Heliotropismus der Pflanzen* (1890); Lloyd Morgan also criticized the anthropomorphic interpretation of animal behavior in his *Introduction to Comparative Psychology* (1894). In 1898 Bethe attempted to account for all the complicated activities

on in the rat's mind when he is finding his way through the maze? In the phraseology of Briggs' cartoons, "I wonder what a rat thinks about" in such a situation, would be the question the psychologist would posit for himself. You can ask a human being to introspect, and he can give you a verbal report on his mental processes. But a rodent, lacking language, must remain a speechless mystery. The only step that seemed to be left was for the psychologist to make believe he was a rat, and then conjecture that probably the rat would feel about the same way as he himself, in the same predicament. The psychologist would resemble that simple-minded lad who was the only one to succeed in locating the farmer's ass which had wandered away. The simpleton soon found the lost animal. In describing the method he used, he explained: "I asked myself, 'Which way would an ass naturally go?' Well, I went there and there he was." While it was no task at all for the moron to identify himself with the ass, it was not so easy for the psychologist to picture the mental life of a rat as seen from the inside. Watson realized the dangers and difficulties in an anthropomorphic animal psychology, but what was he to do? If he ceased to study consciousness, he would be resigning, according to the standards of his time, from the ranks of psychology. It was a crisis in his career.

Watson met the challenge of the problem by coming out openly in favor of limiting animal psychology to the observation and description of behavior, and then insisted that this objective method which ignored consciousness was psychology just as truly as the old Introspectionism was psychology. Animal psychologists were urged to abandon

of bees and ants, by means of chemical responses, without any reference to consciousness. E. L. Thorndike, in 1898, described his investigations of animal behavior without resorting to mental concepts—"Animal Intelligence," *Psychological Review Monograph Supplement*, Vol. 2, No. 4. All of these men, and others, antedated Watson in dehumanizing animal behavior.

the absurd position of attempting to construct the conscious content of an animal whose behavior was under observation. This stand on Watson's part necessitated an elaboration of his views in defence of his position. He extended his Behavioristic hypothesis to include the human being, for if the behavior of a rat can be studied to advantage without reference to mind, why not *homo sapiens*, too? It was on this count that Watson came into conflict with the Introspectionists, and before the air had cleared, he had not merely stated that consciousness was no subject matter for a scientific psychology, but had majestically ruled it out of existence. While the controversy was raging, Watson attacked some of the vulnerable spots in Introspective psychology which we have already mentioned. In addition he objected strenuously to the barrenness of Introspective psychology, which, he charged, had failed to contribute anything of a scientifically usable kind to human nature—in helping people to understand why they behave as they do and how to modify their behavior.¹

Consciousness cannot be accurately reported. All terms which savor of such a mysterious entity as mind must be discarded. Consciousness, sensation, perception, image, will, and like terms are avoided because Watson believes that no one can use such terms in a comprehensible fashion. He himself has found that psychology can be adequately presented without them. Scientific psychology, therefore, should confine its interest to objective behavior which can be readily observed and described.

The method of Behaviorism may best be described by referring to three of its aspects: its mechanistic conception of the human being, its analytic approach, and finally its interest in prediction and control.

¹For a more complete account of Behaviorism as a movement in psychology, see A. A. Roback: *Behaviorism at Twenty-Five*. 1937.

1. *Materialistic Mechanism.* Man is viewed by the behaviorist as a machine going through certain performances which may be readily observed and described. Behaviorism is anti-teleological. A machine just behaves—it has no end in view. If a mechanical animal is constructed which turns toward a light, one might be tempted to say he heeds the light because he is curious. “To say that he goes to the light because of curiosity is to say that he goes to the light because he goes to it. Curiosity is a way of behaving, not a non-physical force that directs behavior.”¹ The same dictum of course applies to *real* animals and *real* human beings for they too are robots, though more complicated, mechanically speaking.

2. *Analysis.* Thoroughly scientific in its spirit, Behaviorism adopts the analytic method for studying human behavior. The psychologist finds two factors in behavior which are open to observation—the *stimulus* which affects the individual and the *response* which the individual makes to the stimulus.² What happens in between the stimulus and the response (in the so-called mind) is completely ignored because it belongs to the realm of the unseen. Man’s physical structure—the apparatus by means of which he behaves—is analyzed into its most minute parts, with special attention to the receptors (sense organs which pick up stimuli), nervous system, and effectors (muscles and glands which carry out the responses). Behavior is analytically reduced to reflexes by the Behaviorists just

¹C. N. Rexroad: *General Psychology*, p. 29. 1929. As for myself, I can honestly say that I not only behave curiously (out of curiosity) at times, but that also now and then I *feel* curious as well.

²The study of behavior in terms of stimulus and response was neither introduced by Watson nor was it peculiar to Behaviorism. Thorndike, in 1913, in his *Educational Psychology*, had used the concept of the S-R bond to help explain the processes of learning. In 1918 Woodworth developed a “stimulus-response psychology” in his *Dynamic Psychology*. It was in 1919 that Watson, in his *Psychology from the Standpoint of a Behaviorist*, described behavior as consisting of stimuli and responses. See F. S. Keller: *The Definition of Psychology: An Introduction to Psychological Systems*, pp. 58-59. 1937. Also, W. S. Hulin: *A Short History of Psychology*, pp. 165-166. 1934.

as consciousness is reduced to sensations, feelings, and images by the Introspectionists.¹

3. Prediction and Control. What is the purpose behind the analysis of behavior? What end can be gained by studying the relation between stimulus and response? If a given stimulus would always evoke a given response in a given individual, then it would be possible to predict what the response would be when a certain stimulus is applied, or to know what stimulus should be presented to call out a desired response. The best we can do, as the Behaviorist himself admits, is to predict in terms of probability, for an observer can never be absolutely positive that a particular stimulation will always affect a certain individual in the same way. Probability may be a matter of the general human ignorance which limits all scientific knowledge. In addition to this factor of ignorance, and the factor of individual differences,² there is the variability of the human mind interposed between the stimulus and the response:

Stimulus—response (Behaviorist)

Stimulus—(mind)—response.

Watson regards psychology as a purely objective branch of natural science; the goal of which is the prediction and control of behavior, without reference to any introspective data from the realm of consciousness. Behavioristic psychology seeks to discover through systematic observation and experimentation the laws and principles which govern man's behavior. Two problems are involved in this program—the one of uncovering the situation evoking a certain response, the other of predicting the response likely to be called out by a given situation. An adequate

¹*Gestalt* psychology objects to the analytic method of the Behaviorists. To the Configurationist, behavior is a total pattern. See R. H. Wheeler: *The Science of Psychology*. 1929.

²The fact that individuals differ from each other in structure and function.

knowledge of these factors would make possible a control over behavior which is a practical goal worthy of our best scientific efforts.

One problem is the ferreting out of the situation responsible for a given response. When Frances St. John Smith disappeared from Smith College, a psychoanalyst was summoned to investigate the personality of the girl in order to ascertain whether she was the sort of person who would commit suicide, or whether there were any circumstances that might incline a person of her temperament to run away. The response, disappearing, was given; the question was, why did she disappear? The answer to that question, the authorities believed, might help them in tracing the missing girl.¹

The other problem is predicting the response likely to be evoked by a given situation. Psychology is interested, for example, in the question as to whether armament programs are conducive to war. If the nations persist in preparing for war, is it more likely that international conflicts will ensue? Given more battleships, more bombing planes, larger armies, more extensive military training for youth, and more intense nationalistic aspirations, will the consequence be war? Militarists are inclined to say "No" and pacifists to say "Yes." The determination of the correct answer is a very important psychological problem.

Knowledge promises foresight, and foresight means control because it renders prediction possible. The problems of prediction and control, upon which Behaviorism lays so much stress, are the most important ones for psychology to study, as they bear upon human conduct. Psychologists of all schools must be frank to admit that they are baffled by the complexity of the task.

4. Criticism. The Behavioristic method is a valuable one but it is not the only approach to psychology. Its

¹The Boston *Advertiser*, January 31, 1928.

main deficiency, to my mind, is its inadequate account of motivation, for when the psychologist, as a student of human nature, has observed a person's behavior and described it in every least detail, we do not feel that he has revealed all we want to know about the person in question. The Behaviorist is satisfied when he has secured an exhaustive description of what the individual is doing. The collection of data on behavior is valuable, essentially, as evidence for inferring what has been going on in the mind of the performer. We not only want to know what he is doing but also why he is doing it. In other words, we suffer from an insatiable curiosity to learn what was the *motive* behind the behavior. Until we have ascertained the motive responsible for the action we are not satisfied that we know all we are eager to learn about the individual who is behaving in the particular situation. In order to understand a person, we must also know the person. To know the person, we must find out all we can about his organism, it is true—but we must also undertake the more difficult task of delving into his mental processes—particularly his motives. We are still far from the real man when we merely observe his behavior. An understanding of the man calls for a penetration beyond the behavior to the personality expressing itself in the pursuance of its ideals. The view here suggested implies that human nature consists of both body and mind. If we desire to gain a complete view of any person we must realize that there is a subjective phase to human nature, thoughts, feelings, and desires, the inner world of *mind*, and there is, in addition, an objective phase to human nature, the outer world of *behavior*. The conviction that an understanding of behavior necessitates an investigation of the mental states behind actions has practical consequences of real importance. Take, for example, the problem of training a child. It is important that parents understand the mo-

tives responsible for the conduct of their children, since the motives are the fundamental matter rather than the conduct itself. A child who may appear, on the surface, to be engaged in malicious behavior may really be actuated by a desire to be helpful, as in the case of the little girl who sprinkled Dutch Cleanser all over the dining room after watching the maid clean the tiled bathroom in that manner.

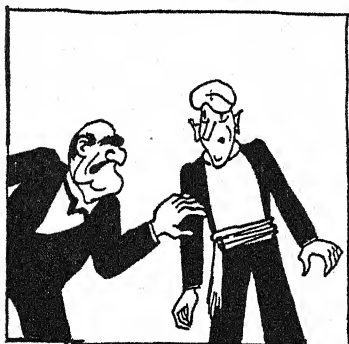
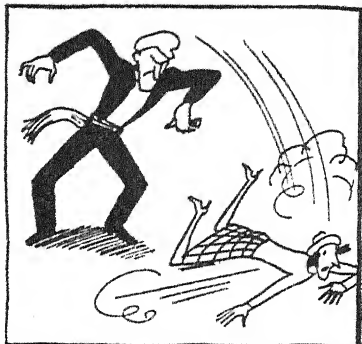
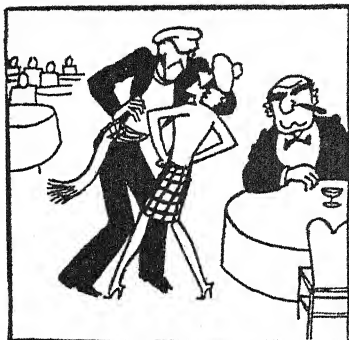
Unless the observer discovers what is going on in a person's mind, he is quite likely to misinterpret the behavior of that individual. The cartoon on the following page illustrates the point.

The importance of probing beyond behavior to motives was evident in the trial of Sacco and Vanzetti. One of the indictments upon which the prosecution rested was that Sacco and Vanzetti, on the day they were arrested, manifested behavior showing "consciousness of guilt." There was no doubt as to their behavior upon the occasion of their arrest. The Behaviorist might have given an exact description of their every move, but legal action must go further—it must find out what it was in the minds of these two men which would account for their behavior. The ascertainment of the motive was no easy task. The court fell into grave error in attacking the problem. Prince pointed out clearly the fallacies committed:

As to behavior showing "consciousness of guilt" as evidence of a particular crime upon which Judge Thayer laid great stress in his charge to the jury, I do not hesitate to say that though learned in law, Judge Thayer, like almost all lawyers, shows a lamentable ignorance of the science of modern dynamic psychology. Behavior showing a consciousness of guilt involves motives of behavior.

There is no more difficult problem in psychology than the determination of the motive or motives that impel to behavior.

The convicting behavior of Sacco and Vanzetti was lying and (as alleged) attempting to draw a gun while in the motor car



(Reproduced by permission of Walter Schmidt.)

after arrest. As everyone knows, the same conduct may be determined by many motives, and when the motive is fear of punishment, a person may be guilty of more than one punishable act. Sacco, as a notorious anarchist, was . . . guilty of activities for which he feared arrest and the fate of deportation . . . He was actually sought by the United States government. All this Sacco knew and feared.

What did Sacco fear? That could only be told by delving deep into his mind and discovering what meaning arrest had for him.¹

It seems that the Behaviorist, in ignoring "mind," cannot develop an adequate psychology of motivation. This shortcoming seriously detracts from the value of Behaviorism as a methodology for studying human conduct.²

SUMMARY

The Elementarists and the Configurationists are concerned with observing the contents of the mind by means of introspection. The Elementarists analyze mental content into its elements, whereas the Configurationists, taking a non-analytic or naïve approach, describe experience in terms of its total patterns.

Functionalism and Hormism use introspection to observe the activities, rather than the contents of the mind, and they employ objective observation to investigate the activities of the organism.

The Behaviorists limit themselves to the description of behavior, ignoring the data of consciousness because they elude accurate delineation.

An adequate study of psychology should include the various approaches represented by the different schools. It does not seem wise to limit ourselves to any single

¹Morton Prince: *The Boston Herald*, October 30, 1926.

See W. McDougall: *Outline of Psychology*, pp. 121-122. 1923.

It is important to distinguish between motive and intention.

²For a criticism of the behavioristic treatment of motives, see F. A. C. Perrin: "The Psychology of Motivation," *Psychological Review*, 1923, 30, 176-191.

school. Since elementary students should be privileged to acquaint themselves with different points of view, the elementary course may profitably be made synoptic. Consequently, in our study of experience and behavior we shall draw upon all the schools so that we may gain an adequate picture of human nature, in the conviction that a better understanding of the conscious life will promote a better control over behavior.¹

¹Among the writers who adopt the synoptic point of view in elementary psychology are: E. G. Boring, H. S. Langfeld, H. P. Weld, *et al.*, *Psychology: A Factual Textbook*, 1935; J. W. Bridges, *Psychology—Normal and Abnormal*, 1930; S. I. Franz and K. Gordon, *Psychology*, 1933; A. I. Gates, *Elementary Psychology*, revised edition, 1928; J. H. Griffiths, *The Psychology of Human Behavior*, 1935; C. H. Judd, *Psychology—General Introduction*, revised edition, 1917; G. Murphy, *General Psychology*, 1933, and *Briefer General Psychology*, 1935; W. B. Pillsbury, *Fundamentals of Psychology*, 1923; E. S. Robinson, *Practical Psychology*, 1926, and *Man as Psychology Sees Him*, 1932; M. Schoen, *Human Nature—A First Book in Psychology*, 1930; C. E. Seashore, *Introduction to Psychology*, 1924; R. S. Woodworth, *Psychology*, third edition, 1934.

PART II
THE PHYSICAL MECHANISM

Experience depends on the nature of the physical organism. Part II provides a description of "The Physical Mechanism," with special emphasis on its relation to the mental life. Chapter 3 describes the "Sensory Equipment" by means of which we are informed of the events occurring in our world. Chapter 4 depicts the organizing functions of "The Nervous System." Chapter 5 is an account of the "Motor Equipment" through which we effect our responses to the stimulating situations that have aroused our awareness.

3

SENSORY EQUIPMENT

PSYCHOLOGY is the study of the modes of behavior by means of which living beings adapt themselves to the urgent demands of the environment. Survival in the struggle for existence necessitates a continuous adjustment between the needs of the organism and the physical medium through which those cravings may be satisfied.

The psychologist will find it well to become acquainted with the physiological mechanisms underlying the stimulus-response process in order to secure an adequate picture of mental life in relation to the behavior patterns through which the mind gains its ends.

The first step in adaptation, as has been pointed out, is awareness.¹ The individual must be cognizant of what is going on around him before he can perform the acts appropriate to his immediate environment. He must experience, become conscious of, become aware of the stimuli constantly impinging upon him. Protoplasm, the substance of all living matter, possesses a characteristic excitability. The amoeba, for example, is a unicellular organism that is excitable, but only in a vague, diffuse

¹In our historical account of psychology on pages 13-20, it was stated that many psychologists had turned their attention to the investigation of behavior because they were convinced that the study of consciousness was a fruitless search. This historical shift of interest in no way implies that the author is in sympathy with the view that psychology should ignore the mind.

The criticism of introspection on pages 54-58, likewise, does not mean that consciousness is unimportant for psychology. The author feels that awareness plays a significant role in our adjustments even though we are unable to describe our mental contents with a high degree of accuracy.

way. In the higher organisms, during the course of evolution, specific sense organs (*receptors*) developed which permit an accurate reception of a wide variety of complex stimuli. Instead of being vaguely aware of its surroundings, the organism becomes specifically conscious through its specialized receptors of a certain class of objects or occurrences. Thus, the eyes, for example, render visual experience possible—we do not just *feel* there is something going on, we definitely *see* it. The ears, likewise, pick up a specific type of stimulus—sound waves. Through the eyes and ears, alone, we are affected by an elaborate range of stimuli.

Indeed we may say that the variety of experience stands in direct proportion to the differentiation of the sense organs. We are aware in just as many distinct ways as our receptors will allow—we see, hear, smell, taste, experience pain, heat, tickle, as the case may be.

Our sensory mechanisms determine not only the kinds of consciousness to which we are subject, but also the extent of each special kind of experience. There is a certain degree of sensitiveness to certain stimuli under certain conditions—there are air vibrations which never become sounds or sights because our sense organs are not delicate enough to register them. Psychologically, we say such phenomena remain subliminal, that is, lie below the threshold of consciousness. Man has supplemented the deficiencies of his receptors by the construction of instruments which permit him to study the stars (telescope), or to transmute radio waves into audible sounds. Thus the eye is enabled to see things which otherwise would have passed unseen, and the ear to detect occurrences in the world of nature which otherwise would have escaped our notice.

Awareness of surrounding stimuli is of value, of course, only as it supplies the information upon the basis of which

adaptive responses can be effected. Just as, in the course of evolution, a differentiation of the sense organs has steadily progressed, so there has been developed a specialized motor equipment which makes possible the exact reactions necessary to efficient adjustment. The main *effectors* (motor apparatus) are the striped (skeletal) muscles, the unstriped (smooth) muscles, and the glands. The striped muscles are involved in such familiar acts as running, jumping, or driving a golf ball. When you pick up a heavy weight, you use the biceps, which are striped muscles. The unstriped muscles take care of the internal processes, such as the dilation and contraction of the blood vessels. The glands are of two types—the duct glands which secrete externally or into the alimentary canal, such as the sweat glands and the salivary glands; and the endocrine glands which secrete into the blood stream, such as the adrenal glands and the thyroid glands. Through these various muscles and glands we make our responses to the stimuli which impinge upon us. 119

In addition to excitability, protoplasm exhibits the traits of conductivity and integration. The nerve is a specialized form of protoplasm evolved to conduct and integrate with the maximum effectiveness. Nerves are arranged in a system, the nervous system, which constitutes the link between the receptor and the effector.¹ Were the stimulus to lead immediately to the response, our range of activities would be very limited. Our adaptation would be effective only for a simple environment. The introduction of the complex intermediate nerve processes between the receptor and the effector makes possible the complicated modes of behavior which constitute intelligent adjustment.

The incoming stimulus, picked up by a receptor, sets up an impulse which is conducted by the nerves to the

¹A receptor is a sense organ and an effector is a motor organ.

spinal cord, or, further, to the brain. When the impulse reaches the higher nervous centers conscious experience occurs. Just what the relation is between consciousness and brain activity is unknown. It is one of the tasks of psychology to investigate this intimate relation and to correlate nervous and conscious phenomena as accurately as possible within the bounds of our limited knowledge.

In the brain the nerve impulse is conducted through a very complex set of nerve pathways before it proceeds down the nerve tracts to the effectors. The nervous system through its organizing functions renders possible a systematic response. Our activities must be coördinated if they are to produce an efficient adjustment.

The function of the nervous system is thus to form the organizing link between the receptor and the effector. The elaborate nervous system of the human being, connecting, as it does, a specialized set of receptors with a specialized set of effectors, is the basis for specific types of behavior exactly appropriate to the particular needs which the individual stimuli represent.

In the human being protoplasm has become highly differentiated into specialized receptors, specialized conductors, and specialized effectors. Through the complex bodily mechanism specific functions are performed efficiently, and a high degree of integration is achieved. Action is thus both widely diversified and effectively organized.

SENSE ORGANS AND EXPERIENCE

Receptors fall into three general groups, classified according to the source of stimulation: (1) *Exteroceptors*, which respond to stimuli outside the body, such as the eyes and ears (distance receptors), and taste organs (contact receptors).

(2) *Proprioceptors*, a system of sense organs found in the muscles, tendons, and joints, whose function is to help regulate the movements evoked by the stimulation of the exteroceptors.

(3) *Interoceptors*, or visceral receptive organs, which respond only to stimulation arising within the body, chiefly in connection with the processes of nutrition and excretion.¹

Since the exteroceptive field exceeds the others in its wealth of receptor organs, and since more is known of the exteroceptors, we shall devote most of our attention to the traditional five senses with their respective organs, eye, ear, nose, tongue, and skin (all exteroceptors).² Our chief interest will lie in the sorts of experience to which we are prone by virtue of our special sense organs.

A. Vision. The sense organ for visual sensations is the eye, poetically described as "the window of the soul." It should be clearly understood that our eyes do not see—they merely detect the stimulus and transmit the message along the optic nerve to the back portion of the brain. The experience of seeing requires the transmission of the impulses to the brain from the eyes. In a perfectly normal condition we may have "eyes which see not," as we look, for example, at the face of a friend while we are thinking of something else. It will be, indeed, as though he were not there. Only when we make an effort to "fix" the impression, and relate it through an act of memory to the person whom we see, does the image in our eyes have any meaning for us. Reading disability is often attributed to defective eyes, when the actual source of the difficulty is faulty training in observation.³ Remedial teaching, which corrects the faulty habits of observing, enables the

¹See C. J. Herrick: *Introduction to Neurology*. Third edition, 1922.

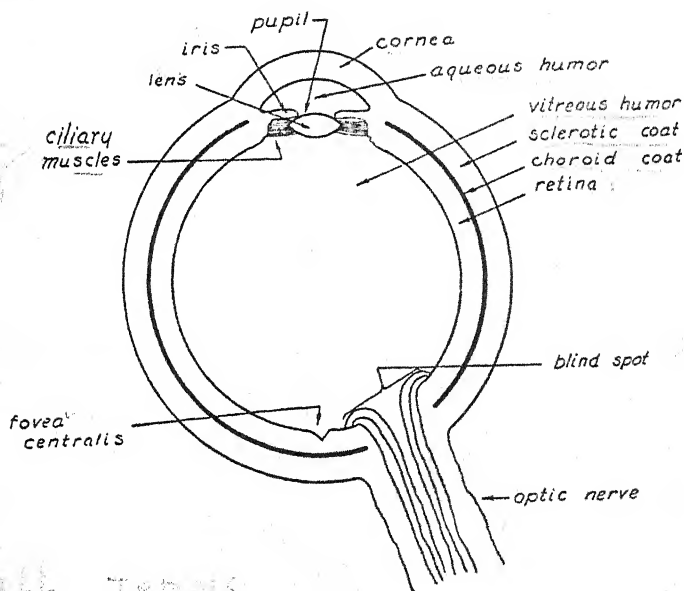
²The actual receptors are located in these organs.

³See M. B. Greenbie: "It's Hard to Read," *Atlantic Monthly*, October, 1937.

child to see better and thus to improve his reading capacities.

The eyes contain end-organs which have become specialized in their sensitivity to light waves. Photochemical substances have been evolved which are delicately sensitive to light, and lenses have been developed to facilitate exact registration. Further, the eye is mounted in a socket which permits ready turning in many directions.

The structure of the eye may be represented by a simplified diagram:



The fact that we have *two* eyes adds considerably to the complexity of experience. The importance of binocular vision will be noted when we consider the visual factors in the perception of distance. A person with one eye is handicapped in his adjustments, because his reception of stimuli is inaccurate as compared with that of the normal person.

1. How Babies Learn to See. During the first three weeks of infancy the visual apparatus is not yet complete, so that the new-born baby who seems to be staring fixedly at his adoring father is actually seeing nothing. The eye-balls move vaguely at first, and during the early days they look almost blindly around them. They are unseeing eyes. Until there is answering intelligence within, the image of the object before the child conveys nothing to him. A lamp held before the face of the child will, in the course of a week or so, be followed by the eyes waveringly and indefinitely. It probably appears to the infant, whose intelligence has not yet developed, as a mere blotch of orange color. Gradually, as the weeks go on, the more definite and brilliant objects as they are presented before the baby begin to excite feebly at first a sense of interest and curiosity. They appear very faint at first, but gradually increase, and with the increase comes a rapid gain in the perceptive capacities. Thus the receptors furnish the data by which the mind develops, and the more the conscious life evolves, the more the material of sense takes on meaning. The sensory apparatus plays a large role in the nourishment of the intelligence.

In order to understand the functioning of the eye it will be necessary to consider the visual process in some detail.

2. The Pupillary Reflex. The amount of light admitted to the inside of the eye is regulated by the iris which expands or contracts to vary the size of the pupil, thus serving the same function as the diaphragm in a camera. In a dim light the pupil is larger than in a bright light. The regulation of the size of the pupil is automatic (*reflex*). The pupil may be seen contracting by turning a flash-light directly upon the eye. Contraction may be observed when the focus is shifted from a far to a near object.

3. Accommodation. In order that the stimulus may be properly registered, the light rays must be focused upon the *retina*. The lens performs this function through the process of accommodation. In the human eye focusing is effected by changing the curvature of the lens. The curvature of the lens is regulated by means of muscles attached to each end—accommodation. Defects in the lens are compensated by the wearing of glasses which make it possible to focus properly without undue strain. If a person with normal vision puts on glasses worn by a near-sighted individual, everything will be a blur—since the rays no longer are focused on the retina. With advancing age the ligaments of the lens lose their elasticity—hence an elderly person who has misplaced his spectacles will hold a book at full arm's length in order to see it clearly.

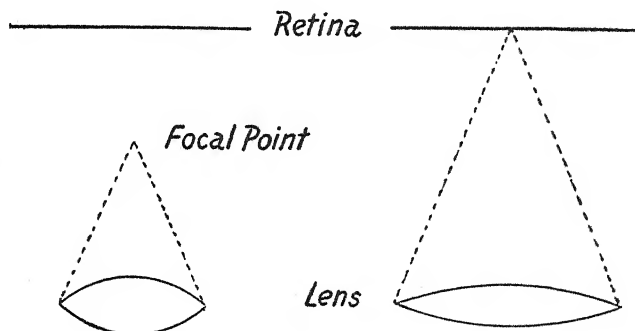
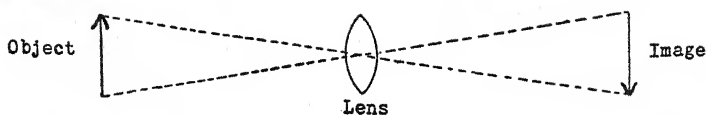


Diagram illustrating how the curvature of the lens is changed to focus the rays on the retina.

When light rays are passed through a convex lens the image is inverted:



The image is upside down on the retina. Why, one may ask, then, do we not see the world upside down? The answer is simple enough—we have never seen the world right side up, so we are not conscious that we see it upside down. If you were to wear glasses which would cause the image to be upright on the retina (a totally new experience), the world would appear inverted. After a few days you would become adjusted to the topsy-turvy appearance of the environment. You could learn to reach for and handle objects in a nearly normal fashion, though you would still experience an “illusory visual disorientation effect.” Upon removal of the lenses, it would be found that motor habits acquired during inversion, such as sorting cards, would not interfere with the ability to sort cards under normal vision.¹

4. The Retina. Within the retina lie sensitive photochemical substances contained in the *cones* and *rods*. It is to these specific organs that we must turn for an explanation of most visual phenomena. Light waves set up chemical changes in these receptors, which are transmitted as impulses to the optic nerve.

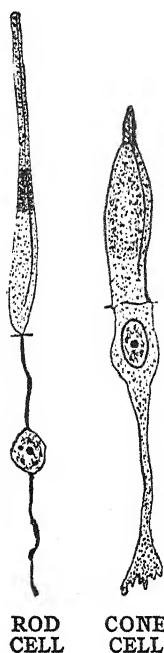
The point of clearest vision is directly behind the nodal point of the lens, the fovea centralis, where there are only cones. The cones become fewer and the rods more numerous toward the periphery—on the outermost periphery there are mostly rods, very few cones.²

According to the duplicity theory, the cones and rods differ not only in structure but also in function. The rods

¹This experiment was originally performed by Stratton. More recently Ewert has gathered further evidence on the problem.

See G. M. Stratton: “Vision without Inversion of the Retinal Image,” *Psychological Review*, 1897, 4, 341; P. Ewert: “Effect of Inverted Retinal Stimulation,” *Genetic Psychology Monograph*, 1930, 7, 177; and G. D. Higginson: “An Examination of Some Phases of Space Perception,” *Psychological Review*, 1937, 44, 77-96.

²The periphery of the retina consists of those portions of the retina which are located toward the front of the eye. When an object is seen “out of the corner of the eye,” the periphery of the retina is involved.



are totally color-blind since they yield no chromatic vision. Chromatic vision is taken care of by the cones. Also the cones are specially suited for daylight vision and the rods for twilight vision. In daylight an object is seen most effectively by looking straight at it so that it becomes focused on the fovea centralis. In the twilight when the light is dim an object may be seen best by looking to one side of it so that it becomes focused upon the periphery. The rods are especially sensitive to weak lights. Nocturnal animals like the bat have only rods. On the other hand, chickens have only cones and must roost at twilight.¹

Where the optic nerve leaves the eye, there are neither rods nor cones. This region is known as the *blind spot*. You may demonstrate the presence of the blind spot to yourself by a simple experiment:



Hold the diagram about six inches in front of you so that the cross is directly in front of the right eye. Close the right eye. Keep the left eye fixated on the cross while you move the book away. At a certain distance the dot will disappear, as the image of the dot falls on the blind spot.

We are not usually conscious of the blind spot because our eyes are constantly in motion, because the image does not fall on the blind spots of both eyes simultaneously, and because we fill in, out of our imagination, the gap in our

¹For an excellent account of the eye as a receptor, see J. R. Butler and T. F. Karwoski: *Human Psychology*, Chap. 7, "Receptors: The Eye." 1936.

vision. The subjective addition to perception may be discovered by the following experiment:

V

V

Close the left eye. Bring the left V close up to the right eye, and gradually move the book away, keeping the gaze fixed on the top of the left V. At a certain point, the right V will disappear, because it falls on the blind spot. Now, still keeping the gaze fixed on the top of the left V, examine the rest of the line to the right. Do you see it continuous to the end? If so, you are filling out a part of the line for which there is no image on the retina.¹

We shall now note further aspects of visual experience and attempt to explain them in terms of the structure of the retina.

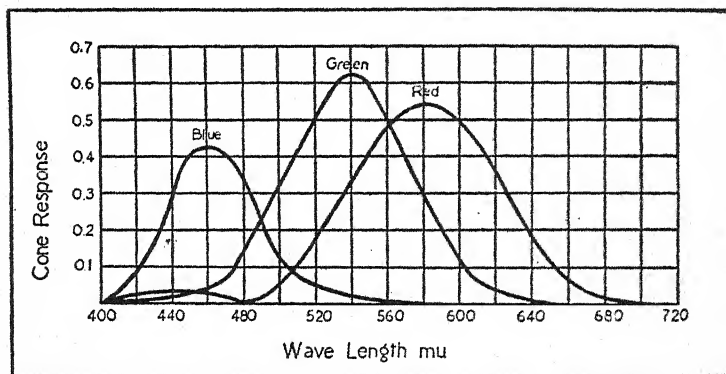
a. Spectrum. The colors which may be seen with the naked eye range all the way from red on the long-wave end to violet on the short. Color is not a physical thing, but a psychological response to physical vibrations.

There are over one hundred theories that have been advanced to explain color effects. Most of them may be classified under three headings: (1) Specificity of cone function, assuming that one set of cones mediates only one particular color; (2) non-specificity of cone function, assuming that each cone is capable of mediating the whole gamut of color experience; and (3) those hypotheses which hold that the determination of color is partly a function of the higher nerve centers.

The Young-Helmholtz theory is a modification of (2) and (3). Newton had discovered that white light may be analyzed into all the colors of the rainbow by passing it through a prism. Later it was learned that all the 128

¹Taken from G. Humphrey: *The Story of Man's Mind*, opposite p. 58. 1923. By permission of Dodd Mead and Company.

distinct hues of the spectrum could be represented by combining red, green, and blue wave lengths in different proportions. The Young-Helmholtz theory, modified later by Hecht, postulates three cone mechanisms to correspond to the three variables of color vision: one for red, one for green, and another for blue or violet. According to this theory, while the red cones are maximally sensitive to their particular red wave length, they respond in lesser degree to all wave lengths. The green and blue cones also respond in a graded manner to the spectral wave lengths. The following curves were obtained by mixing three particular light waves in different proportions to match all the spectral colors.

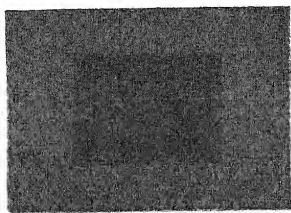
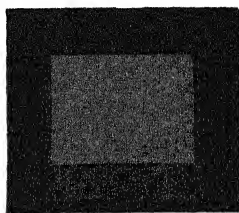
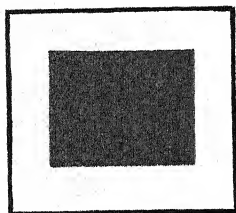


RESPONSES OF CONES TO SPECTRAL STIMULI

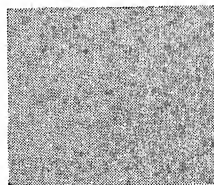
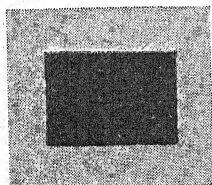
These three curves represent the sensitivity of the red, blue, and green cones to different wave lengths and the wave-length-mixture relationship upon which the Young-Helmholtz theory is based. Note that each cone is represented as maximally sensitive to its particular wave length, and sensitive in a lesser degree to other wave lengths.

(From Troland's *Psychophysiology*, Vol. 2. Courtesy of D. Van Nostrand Company, Inc.)

When a stimulus excites all three kinds of cones, but in unequal amounts, the resulting hue is determined by the two kinds of cones which are excited most strongly. If all

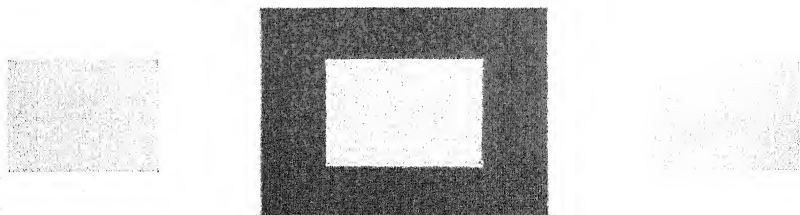


EFFECT OF ENVIRONMENT ON COLOR

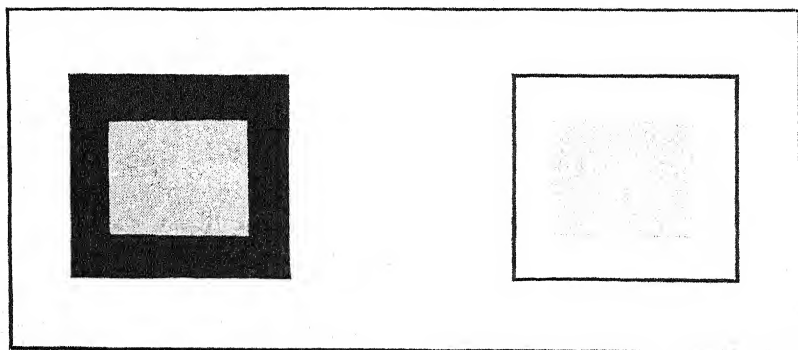


NEGATIVE AFTER-IMAGE





SIMULTANEOUS CONTRAST



SIMULTANEOUS CONTRAST

three cones are responding simultaneously in equal measure, the resulting experience is that of an achromatic color.¹

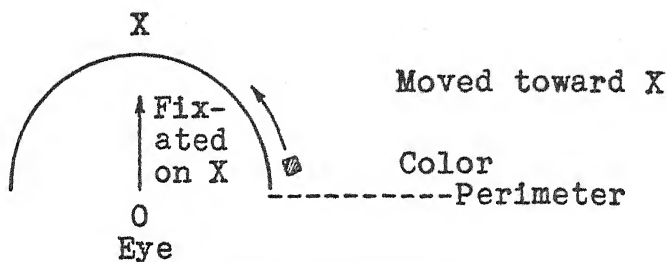
More recent modifications of the Young-Helmholtz theory tend to shift the function of color determination from the cones to the brain. The sense organs in themselves cannot account adequately for the complex facts of color experience.

There are many vibrations of which we never become aware—without the aid of instruments—the infra-red and ultra-violet rays—because the retina is not constructed to receive the light waves on the two extremes. Ultra-violet rays do not excite visual sensations because there are no substances in the retina sensitive enough to detect them. If your radio set is not built to pick up certain stations, the waves transmitted by those stations will go unnoticed. The structure of the eye similarly imposes limits upon our experience. A striking illustration of this fact is found in color-blindness.

b. Color-blindness. Color-blindness usually is only partial, in the form of red-green blindness. It is very uncommon among women but present in about three per cent of the men. A person who is partially color-blind may mistake red for a dull yellow and purple for a dull blue. His experience is a good example of the statement, previously made, that color is a psychological response to physical vibrations—the same vibrations may provoke the experience of red in a normal person and dull yellow in a color-blind person. Color-blindness is native and cannot be corrected by training. It is a serious deficiency in motorists, paper hangers, and railway engineers.

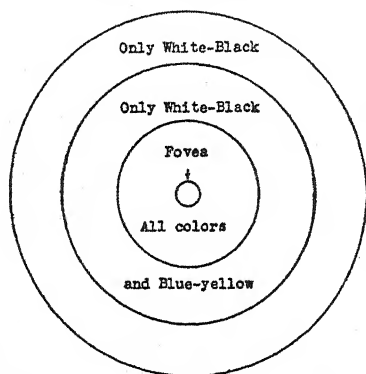
How is color-blindness to be explained? The eye may be plotted as illustrated at the top of the next page.

¹Achromatic refers to the black-white series.



COLOR PERIMETER

Any color moved along the perimeter will be seen as different colors according to this general plan. In extremely



COLOR ZONES

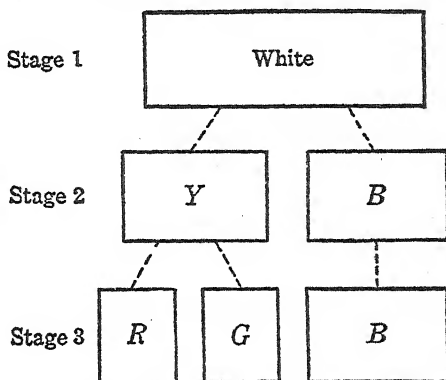
marginal vision all lights of average intensity are neutral gray. All colors may be seen peripherally, however, provided the stimulus is sufficiently intense although the periphery of the retina is almost totally color-blind. In this region rods predominate. A totally color-blind person would probably have no cones, only rods, while a partially

color-blind person would be defective in certain cones usually present in the region about the fovea, lacking the cones necessary for seeing red and green. It has been concluded, on the basis of these phenomena, that the rods take care of achromatic vision and the cones of chromatic vision.

In terms of the Ladd-Franklin theory,¹ the retina has evolved through three stages. In the earliest stage the visual response was limited to white and black, no matter what the wave length of the stimulus; in the second stage, the visual response was differentiated into yellow for the

¹C. Ladd-Franklin: *Colour and Colour Theories*. 1929.

long waves and blue for the short waves; in the third stage, the yellow response was split into red for the longest waves and green for the medium waves. According to this theory, red-green blindness is due to the fact that the central retinal zone is arrested in the second stage of evolution and total color-blindness is due to the fact that the whole retina remains in the first stage of evolution.



c. After-images. The positive after-image may be experienced by whirling a lighted match in the dark. A circle of fire remains after the match is extinguished. Another way to obtain the positive after-image is to turn on an electric light, stare at it for about thirty seconds, and turn it off. The image persists and is of the same yellow (positive) as the glow of the bulb. The positive after-image is to be explained in terms of inertia—the retinal process, having started on its way, continues of its own momentum.

A more striking phenomenon is the negative after-image (successive contrast).

Look steadily at the boy's nose in the center of the picture for about thirty seconds. Then stare at a blank wall,



preferably, keeping the gaze fixated on one spot, until the after-image looms into view. Note that the white and black portions have shifted, the white turned to black and the black to white (hence the term negative).¹

Stare at the green square on the gray square in the diagram facing page 90 for about thirty seconds. Then cover the left-hand figure with a paper and transfer your gaze to the gray square on the right. A red after-image will appear on the gray background. The negative after-image is always of the complementary color.

Hering's theory of vision explains the negative after-image in terms of equilibrium.² According to Hering there are three types of organs in the retina and each pair of complementary colors is produced by antagonistic changes in the same organ:

ANABOLISM	KATABOLISM
<i>induced by</i>	<i>induced by</i>
Green	Red
Blue	Yellow
Black	White

A light wave, for example, which sets up an anabolistic process in the Green-Red organ will evoke the sensation of green. The equilibrium is upset. Katabolism sets in to restore the organ to its normal state, thus giving rise to the after-image of red. The equilibratory nature of the visual process may be seen by looking at a lamp with a green shade and then turning out the light. In the darkness a red after-image will appear (negative), then a green after-image will come (positive), then a red after-image will reappear, and so on through a series of oscillations until the shifting process achieves a state of rest or equilibrium.

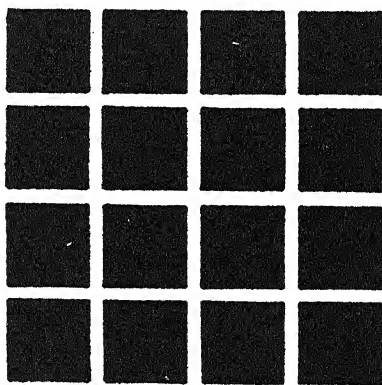
¹Courtesy of Snyder's Stores.

²Hering's theory of color vision is tri-chromatic. It is like the Young-Helmholtz theory in this respect, though it differs in others. The Hering theory is one more of the many hypotheses to explain color experience.

d. Contrast. The negative after-image is a case of successive contrast. Another contrast phenomenon is simultaneous contrast, which may be observed in the following experiments: The three gray squares in the diagram facing page 91 are the same gray. Note that the gray square on the green background has a pinkish (complementary color) appearance. Cover the figure with tissue paper and the effect will be exaggerated, since the contrast is enhanced by obscuring the contours.

The two grays are the same, yet the one on the black background appears much lighter, by contrast, than the gray on the white background. Another illustration of brightness contrast is seen in the figure below.¹ Note the apparent shadows at the intersections of the white strips.

Simultaneous contrast (or retinal induction) occurs as the retinal substances tend toward equilibrium over the whole area of stimulation in such a way as to be directly affected at one point and indirectly—



and oppositely—affected at all other points, though most noticeably in the immediate neighborhood of the stimulus.

e. Color Mixture. If complementary colors are mixed on a rotating color wheel in the right proportions, a sensation of gray will result. Blue and yellow, for example, will produce a gray. You may remember in your school-days that you mixed blue and yellow pigments in order to get green. The pigments are not pure colors, the blue

¹M. Luckiesh: *Visual Illusions*, p. 118. 1922. Courtesy of D. Van Nostrand Co.

containing some green and the yellow some green. Paints in reflecting the light waves absorb some of the waves, thus affecting the consequent sensation.

If blue and yellow are mixed, according to the Hering theory the anabolistic and katabolistic processes should balance each other and leave nothing as a result. But actually a gray remains. To account for this fact Müller postulated a cortical gray—a gray produced by the cortical cells, the central organ for vision in the occipital lobe. Blind persons, if not blind from birth, always see this gray.¹

One type of color harmony used in interior decoration is complementary. The effect of environment upon the appearance of colors is shown by the figures facing page 94. A particular color must be selected with an eye for its relation to the other colors in the scheme. A wheel is sometimes used in which complementary colors are arranged directly opposite each other. If you are matching a linoleum to your kitchen woodwork, you look up the color of the wood as represented on the wheel, and then the desirable color for the linoleum is readily discovered. Make-up testers for matching cosmetic colors are bringing the psychology of color down to a science. Correct color in decoration is a valuable asset.

f. Adaptation. One of life's most embarrassing situations confronts the individual who deserts the sunlight for the dark shadows of the theater. The process of locating a seat is rendered hazardous by the simple fact that one can see neither the aisle nor the people one is stumbling over.

This phenomenon is to be explained by the fact that in the sunlight or other bright light, the visual purple

¹C. E. Ferree and Gertrude Rand: "Some Areas of Color Blindness of an Unusual Type in the Peripheral Retina," *Journal of Experimental Psychology*, 1917, 2, 295-303.

in the rods of the retina is bleached.¹ In the theater, twilight conditions prevail so that it is principally the rods which come into use. The visual purple is regenerated in the dark, thereby, in some way, increasing the sensitivity of the rods. While the regeneration is proceeding, vision gradually improves until objects begin to take on definite outlines. After one has been in a dark room for several hours and the visual purple has been considerably restored, sudden emergence into bright light hurts the eyes which are then unduly sensitive. Bleaching of the purple must occur to some degree before it is comfortable to expose the eyes steadily to the surroundings. The bleaching and regenerating of the visual purple in the rods constitutes one process of adaptation. Adaptation to colors also occurs, though not so often in daily experience. The retina becomes adapted, if one stares at a color, so that it gradually fades. With foveal vision, however, chroma does not completely vanish even with prolonged fatigue.

5. *The Importance of Color in Our Experience.* That colors profoundly affect us may be illustrated by the employment of colors in medical treatment. Zeller was one of the pioneers in this field.² Convinced of the recuperative value of colored light in the case of persons affected with nervous disorders, he set up sun parlors with ruby, violet, amber, and opal window-panes in the Peoria, Illinois, State Hospital, with walls, artificial lights, and bedclothing colored in harmony. Zeller was transferred to another field of activity, and his successor, who considered the entire color scheme nonsensical, removed all the colored panes and replaced them with clear glass. On his return, eight years later, Zeller partially reinstated

¹The visual purple is the photochemical substance in the rods.

²See Sixth Biennial Report of the Commissioners, Superintendent, and Treasurer of the Illinois Asylum for the Incurable Insane at Peoria, pp. 15-16, June 30, 1906.

color treatment. Color, he discovered, acts in three distinct ways—as a stimulant, as a sedative, and as a recuperative. Color is a sedative when it has the power to induce contemplation, indifference, and melancholy. It is said to be recuperative when it creates conditions of change, generosity, and contentment. Stimulative colors excite hope, ecstasy, desire, aspiration, ambition, and action. Yellow has proved to be stimulating. Red must be used with the same discretion as morphine. It is highly stimulating. Too much red can disturb the mental balance of a delicately poised mind. When violent patients are placed in a room in which the red ray predominates, they rapidly become worse. When placed under the influence of the blue ray, they become calm and quiet. Ponza, a French psychiatrist, placed a patient afflicted with morbid taciturnity in a red chamber. After a period of three hours, the patient became gay and affable. Another patient who had refused all food until he had reached the danger point asked for breakfast after twenty-four hours in the red room. In the blue chamber Ponza placed a patient so highly excited that he was confined in a strait-jacket. It is recorded that one hour later there was a decided change for the better.

The effects of color upon the human mind are just beginning to be appreciated. A manufacturer near New York redecorated the women's cafeteria in his factory in light blue. The women complained that the room was so cold they had to keep their coats on during lunch. Knowing that the temperature of the room was constant, the manufacturer called in a color engineer. It was recommended that the baseboards be painted orange and that orange slip covers be placed on the chairs. As soon as the changes were made, the complaints ceased.¹

¹This paragraph and the two following are based on Howard Ketcham's article, "Color Schemers," in *Harper's Bazaar*, February, 1937.

Magenta light has been found to be very conducive to sociability on such an occasion as a dinner party. The soft, flattering glow makes the women look younger—which encourages gallantries from the men—and inspires easy conversation.

Colors become symbolic means of associations built up through experience. Thus red comes to stand for courage and anarchy, yellow for cheerfulness and cowardice, purple for heroism and passion. When Blackfriar's bridge in London was painted a bright green to supplant the black surface, suicidal leaps from the bridge were reduced by more than one-third.

6. *Some Effects of Poor Vision.* Poor vision which is due to ocular defects may seriously affect the development of personality. Children who do not see adequately may be considered unintelligent by teachers who fail to recognize the sensory inferiority. A woman with weak eyes refused to wear her glasses because she felt they impaired her charm. She frequently failed to recognize friends on the street, and consequently she gained a reputation for being "high-hat." Sometimes the ability to concentrate is facilitated by a narrow field of vision, since stimuli which might distract the person with normal visual acuity remain unnoticed.

A man entered the front of a lecture hall where he sought to catch the attention of his wife who was in the audience. Nearly everyone saw him except his wife. She was intently listening to the speaker, and, according to her husband, the primary reason for her close attention to the lecturer was the fact that without her glasses the gesticulations of her frantic mate lay outside the field of her ordinary vision.

7. *The World of the Blind.* The value of the eyes for the business of living is easily appreciated by observing how the deprivation of sight reduces the range of experi-

ence in the blind.¹ A blind person must rely upon other senses which are not so efficient as vision for receptive purposes. Hearing, for example, has serious limitations, being far less selective than sight. Sight impressions can be focused so that only the data are noticed which are of particular interest to the observer, whereas sound impressions from every point within audible range are received, whether or not the listener wishes to heed them. Considerable effort is necessary to "tune out" extraneous sounds. To the blind, hearing is like a radio set which permits all stations to be heard simultaneously, and leaves it to the audience to concentrate on the one that is of special interest. The constant demand on voluntary attention is tiring. The inability to shift from hearing to sight when the former is fatigued imposes an additional hardship. Then, too, the ears cannot be closed as readily as the eyes in order to retreat momentarily from the bustling world, or to exclude an intense stimulus. It is a mistake to think that the sound conditions most agreeable to the blind are quietness or absolute silence. According to the testimony of one person, some stimulation is desirable:

I find that any unusual quietness produces a depression strikingly like that which gloom produces on the seeing. The dead of night or isolated spots make me strangely dull and uneasy. There is apparently a minimum of received stimuli necessary for mental alertness, which hearing must supply in the case of the blind.²

Books are now being produced in the form of phonograph records so that the blind can enjoy literature without the effort involved in deciphering raised print through the finger tips. For years the blind have been reading

¹See P. Villey: *The World of the Blind: A Psychological Study*. 1930.

See also Helen Keller: *The World I Live In*. 1908.

²C. M. Adams: "The World and the Blind Man," *The Atlantic Monthly*, 1924, 134, 595-602.

publications printed in Braille, a system of tangible dots embossed on paper in certain prearranged formations.¹



AMERICAN BRAILLE

Illustration to demonstrate the principle of the Braille system.

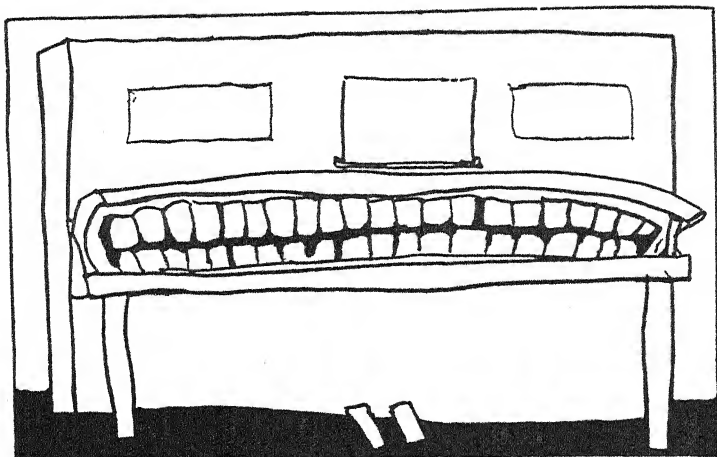
Recent investigations show that not only are Braille letters perceived as wholes, regardless of the number of dots contained therein, but also that entire words are perceived as wholes. Though Braille has been in use since 1829, no one has as yet determined by experimental research what are the best sizes and shapes of print for efficient tactual reading.²

The experiences of an eighteen-year-old girl³ who had been blind from birth and who suddenly gained her sight may shed some light on the early visual impressions of the infant. When she first caught sight of her black-spotted dog, she was alarmed at what she took to be holes in the poor animal. Sunbeams baffled her, for even as she reached for them, they eluded her touch. She had walked so long without the aid of her eyes that her mother had to teach her how to coördinate her steps with her visual cues. She found the process so difficult that when she wished to hurry she closed her eyes and felt her way about, in keeping with the habits of coördination thoroughly established over a period of years. "You can't tell a person how anything looks unless he has once had eyes that saw," she says. "The words don't mean a thing to him."

¹Tangible dots are raised dots that are perceptible to the touch.

²See R. V. Merry: "Fingers for Eyes: The Story of Raised Print," *Scientific Monthly*, March, 1937.

³Miss Joan Getaz of Lincoln, Nebraska.



A BLIND GIRL'S IDEA OF WHAT A PIANO WOULD LOOK LIKE
Feeling the ivory keys of her piano and her own smooth, shiny teeth, Miss Joan had pictured the keyboard as resembling a human mouth with parted lips and large teeth.

(Printed by permission of the *American Weekly*, Inc., 1928.)

8. The Significance of Visual Experience. The vast significance of the visual factor in evolution is not adequately appreciated. Vision, primitively a rival of smell, came to be the dominant sense in the human being. Sight has contributed in an important way to the appreciation of æsthetic values, and thus to sexual selection; and it has played a large role as a means of intercommunication, through the interpretation of gestures and facial expressions. The world and most of what is happening in it are made known to us by sight. Vision is the essential instrument for observation and experimentation. Such words as *insight* and *foresight* are testimony to the fact that man's increasing reliance upon visual guidance made possible the emergence of those expanding powers of discrimination which underlie the superior intelligence of the human being.

B. Audition. The phenomenon of sound involves a source, a transmitting medium, and a receiver. The source is a vibrating object, such as a banjo string, a telephone diaphragm, or a column of air in the vocal organs. The transmitting medium is usually air. Sound waves travel through the air about eleven hundred feet every second. Light waves travel 186,000 miles per second. Hence, we see the steam of a distant whistle long before we hear the blast.¹ The receiver is an apparatus in the ear.² Two ears, of course, can render more effective service in the detection of stimuli than one ear, especially in the matter of determining the direction from which sounds originate.

When the ear is mentioned the average person thinks merely of the external ear, the part that flaps so prominently on the donkey. The function of the pinna, as the projecting part is called, is to collect the vibrations proceeding through the air. A person who is hard of hearing will augment the pinna by cupping his hand behind the ear. The neck is rotated to bring the head in such a position as to arrange the ears in the direct line of the sound.

When you wish to exclude the penetrating noises of civilization, you sometimes stick your fingers into your ears. This section is the external auditory meatus, also belonging to the external ear. You will notice that the passageway goes around a corner, thus protecting the eardrum from objects which might puncture it.

The middle ear begins with the eardrum or tympanic membrane, which vibrates something like the disk on a telephone receiver, in response to air waves. The vibration is then passed on to the malleus, the first of the three ossicles (bones), which is in contact with the drum. The

¹Consult the sound motion picture entitled, "Fundamentals of Acoustics." (Erpi Picture Consultants, Inc.) List price, \$50.

²Consult the sound motion picture entitled, "Sound Waves and Their Sources." (Erpi Picture Consultants, Inc.) List price, \$50.

malleus is so called because it resembles a hammer. From the malleus the vibration is imparted to the incus (anvil) and then to the stapes (stirrup). The ossicles—malleus, incus, and stapes—function as a transformer, decreasing the amplitude of the waves and magnifying their intensity. The middle ear is connected with the throat by means of the Eustachian tube. The tube is opened by the act of swallowing so that air is admitted to the middle ear, thus maintaining a balance of air pressure on both sides of the drum. The air pressure on the inside of the drum may be felt by holding the nose and then attempting to exhale through the nasal passage.

The sensitive receptor for sounds lies in the internal ear,

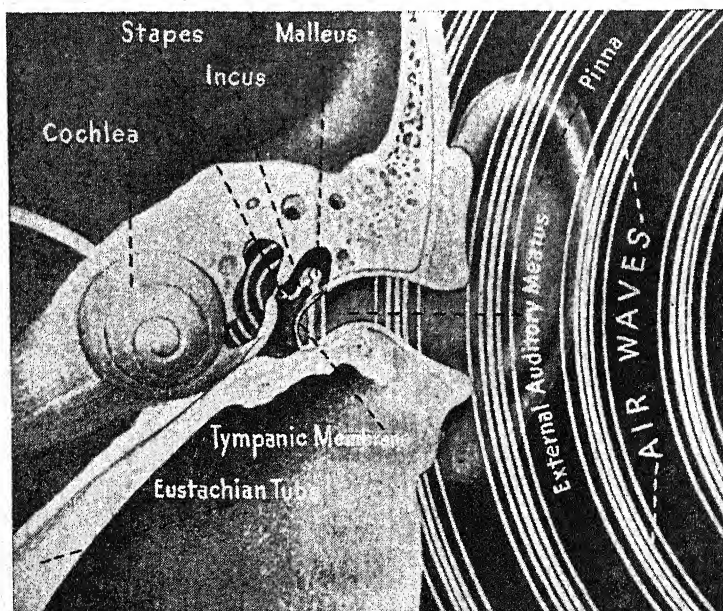
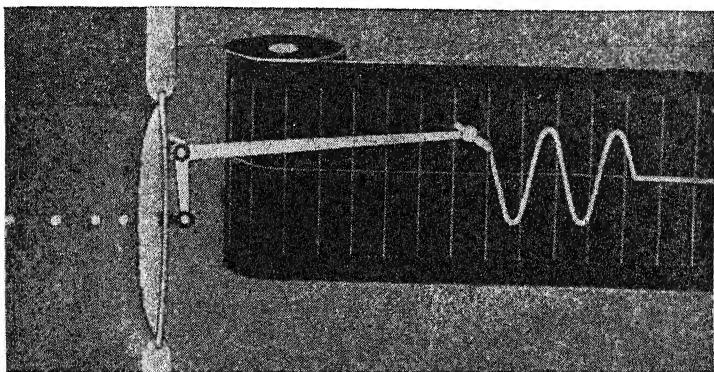


Diagram illustrating the reception of the sound waves by the auditory apparatus.

(Reproduced through the courtesy of The Chicago University Press, and permission of H. B. Lemon and Hermann I. Schlesinger. Subtitles and labels by the author.)

in the *cochlea*, so called because it resembles a snail in its spiral form. Vibrations of perilymph¹ in the cochlea set up by the stapes are picked up by the basilar membrane which is a part of the Organ of Corti located in the cochlea, then imparted by the membrane to the hair cells, thence communicating the impulse to the auditory nerve fibers which conduct the impulse to the temporal lobe of the cortex. It is not until this final stage is reached that a wave motion becomes a sound. The tectorial membrane acts as a damper.²



OSCILLOGRAPH

Pressure variations in sound waves striking the diaphragm at the left are being recorded by the oscillograph stylus.

(Reproduced by permission of The University of Chicago Press. From H. B. Lemon and H. I. Schlesinger: *Sound*. 1934.)

1. Some Phenomena. The structure of the ear renders possible a certain variety of auditory experience within a limited range.

a. Pitch. Tones are characterized by a quality called *pitch*, which refers to the "highness" or "lowness" of the

¹Perilymph is a fluid.

²A number of these statements are subject to controversy. It is not advisable to raise too many issues as the subject is difficult enough without adding confusion to complication.

sound. The pitch of a tone is determined by the vibration frequency of the air wave. In other words, the low frequency of vibration in a bass voice evokes one experience while the high frequency of a soprano gives rise to another. A singer learns to emit an air wave of a specific vibration frequency in order to produce a specific experience in the hearer—256 vibrations to create the impression of middle “C.”

The limits of our experience, whether it be visual, auditory, or any other, are represented by the term *limen* or threshold. An experience must be sufficiently clear before it becomes conscious. The limen represents the amount of clearness which a given experience must attain to arouse awareness.

low frequency  low tone

high frequency  high tone

An instrument called the sound-level meter is used in measuring sensitivity to the intensity of sounds. The lowest audible intensity of sound is zero decibel. The decibel is a unit of comparison for measuring the relative intensity of sounds. The human ear is responsive to sounds ranging from the faintest audible whisper up through the louder noises like that of a riveting machine. The sound-level meter has proved useful in detecting auto squeaks, in locating disturbing sounds in hospitals, and in determining the locations where city noises are most distressing. The following chart is taken from a report of the New York City Noise Abatement Commission.

NOISE LEVEL IN DECIBELS

	Decibels
Threshold of auditory stimulus (Faintest audible sound)	0
Outdoor minimum	10
Minimum city noises	37-45
Ordinary conversation 3 feet distant	65
Busy city streets	48-85
Lion or tiger in zoo, 10 to 15 feet distant	86-87
Automobile horns at 20 feet	72-102
Subway station platform	88-97
Pneumatic riveter at 35 feet	94-101
Hammering on steel at 2 feet	113
Threshold of painful sound (Upper limit of audible intensity)	130

The lowest frequency which the average person can hear as a sound is 16 vibrations per second. This threshold is technically called the R.L. (stimulus limen).¹ It is fortunate, in some ways, that sounds below the R.L. cannot be detected, for if the ears were sensitive to waves slower than the lowest audible sounds, we should perceive at a distance the swaying of trees in the wind, the oscillations of barometric pressure, and the slow movements of the earth beneath our feet. Experience would become "one big blooming buzzing Confusion."² If our ears were so sensitive that we did not need the assistance of a radio set to pick up the programs over the air, life would become the boisterous noise that it now is in some apartment houses where all the radios are booming at once.

The limited sensitivity of our receptors promotes the selectivity of experience by eliminating an overwhelming multiplicity of stimuli.

The average human being can hear a frequency as high

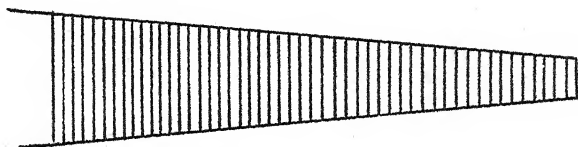
¹R is from the German word, *Reiz*, meaning *stimulus*.

²William James: *Psychology: Briefer Course*, p. 16. 1892.

as 16,000. This is known as the T.R. (terminal limen)—the highest degree of any stimulus which is perceptible.

Between 16 and 16,000 vibrations, the average human listener under 40 years of age can distinguish about 1400 different pitches. The D.L. (differential limen) is the least amount of difference between two stimuli which permits them still to be distinguished from each other. In the middle range of the scale (around 435 vibrations per second) the average person can distinguish tones three vibrations apart.¹

What apparatus in the ear will account for the experience of pitch? The answer given by Helmholtz is the basilar membrane. If you will step up to your piano and sing out a note, and then listen, you will hear, besides the possible protests of your neighbors, a sound of the same pitch coming from the piano. You will discover that the string of the same frequency as the note you emitted has started to vibrate sympathetically with you. This phenomenon is known as sympathetic vibration or resonance. According to Helmholtz, the resonators in the ear are the fibers of the basilar membrane. There are about 18,000 to 20,000 fibers on the membrane, differing in length.²



SCHEMATIC DIAGRAM OF BASILAR MEMBRANE

Illustrating the principle of the arrangement of the fibers of the basilar membrane.

Each fiber is tuned to a specific rate of vibration. When the ossicles impart a certain vibration to the perilymph of

¹C. E. Seashore: *Psychology of Music*, p. 56. 1938.

²Helmholtz' theory is sometimes known as the "harp theory."

the cochlea, the basilar fiber of that particular frequency resonates, transmitting the vibration to the hair cells, which in turn start the impulse along the auditory nerve to the brain—when this final stage has been reached, a sound of a specific pitch is heard. In playing a stringed instrument, you shorten the vibrating portion of the string to produce a high note. By the same principle, a short basilar fiber picks up a rapid vibration, a long fiber, a slow vibration.¹

Suppose a chord is sounded on a piano. The listener not only gets the total pattern, the blend of the notes, but he can detect the separate notes which compose the chord. It is the resonance of the fibers of the basilar membrane that makes the analysis of complex sounds possible.

The resonance theory of Helmholtz has been supported by an ingenious experiment on guinea pigs. It is a well-known fact that exposure to intense noise results in auditory disturbances—witness boiler-makers' deafness. Upton was interested in seeing whether prolonged exposure (70 days) to an intense tone of a specific frequency would decrease the sensitivity to that particular vibration rate without affecting the sensitivity to tones of other frequencies. How could he tell whether the guinea pigs heard the tone or not? The guinea pigs were conditioned so that they would invariably respond by a change in the respiratory rhythm when tones of a particular pitch were sounded. After the seventy-day exposure to an intense tone the animals could not be reconditioned to manifest a specific change in breathing rhythm in response to the specific tone to which they had been listening for so extended a period. Upton's conclusion is that a specific section of

¹There are objections to the Helmholtz theory of resonance, but we shall not go into them.

A wave of a particular frequency actually causes more than one basilar fiber to vibrate. The above description is an oversimplification. It serves, however, to illustrate the principle involved.

the basilar membrane had degenerated under the continuous influence of the particular frequency to which it was resonating. Sensitivity to other frequencies, after the exposure period, indicated that other portions of the membrane had not been affected. The experiment, therefore, seems to support Helmholtz's theory of sympathetic vibration.¹

The localization of pitches on the basilar membrane has been tested by damaging different portions of the membrane and then determining the changes in sensitivity by amplifying the electrical activities involved in the reception of sounds of various pitches. Bray and Wever have found that the deterioration for high tone effects is localized at the narrow base of the membrane but no such definite localization has been obtained for the effects of low tones. They find that a given tone involves a broad band rather than a specific fiber.² Davis finds that destruction of a part of the basilar membrane results in partial deafness. There may still be a sensitiveness to very intense sounds.³

There is some evidence to support the view that the analysis of sound waves is taken care of by the brain. If this view is tenable, the basilar membrane must be regarded as less important in the analysis of sounds than has been supposed and more emphasis must be laid

¹Morgan Upton: "The Auditory Sensitivity of Guinea Pigs," *The American Journal of Psychology*, 1929, 41, 412-421. Also: "Functional Disturbances of Hearing in Guinea Pigs after Long Exposure to an Intense Tone," *The Journal of General Psychology*, 1929, 2, 397-412.

²See E. G. Wever and C. W. Bray: "Present Possibilities for Auditory Theory," *Psychological Review*, 1930, 37, 365-380.

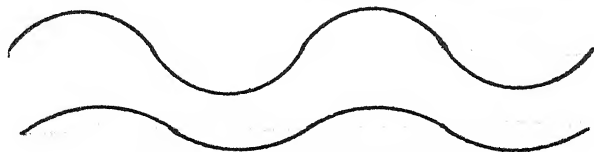
See also C. W. Bray, E. G. Wever, and G. P. Horton: "Localization in the Cochlea as Studied by the Stimulation Deafness Method," *Annals of Otology, Rhinology, and Laryngology*, September, 1935.

³S. S. Stevens, H. Davis, and M. H. Lurie: "Localization of Pitch Perception on the Basilar Membrane," *Journal of General Psychology*, 1935, 13, 297. Also S. S. Stevens and H. Davis: *Hearing: Its Psychology and Physiology*. 1938.

See also J. C. Steinberg and M. B. Gardner: "The Dependence of Hearing Impairment on Sound Intensity," *Journal of Acoustical Society*, 1937, 9, 11-23.

upon the role of the brain in the discharge of such functions.¹

b. Loudness. Air waves not only differ in frequency but in amplitude of vibration. Amplitude of vibration is the



FREQUENCY AND AMPLITUDE

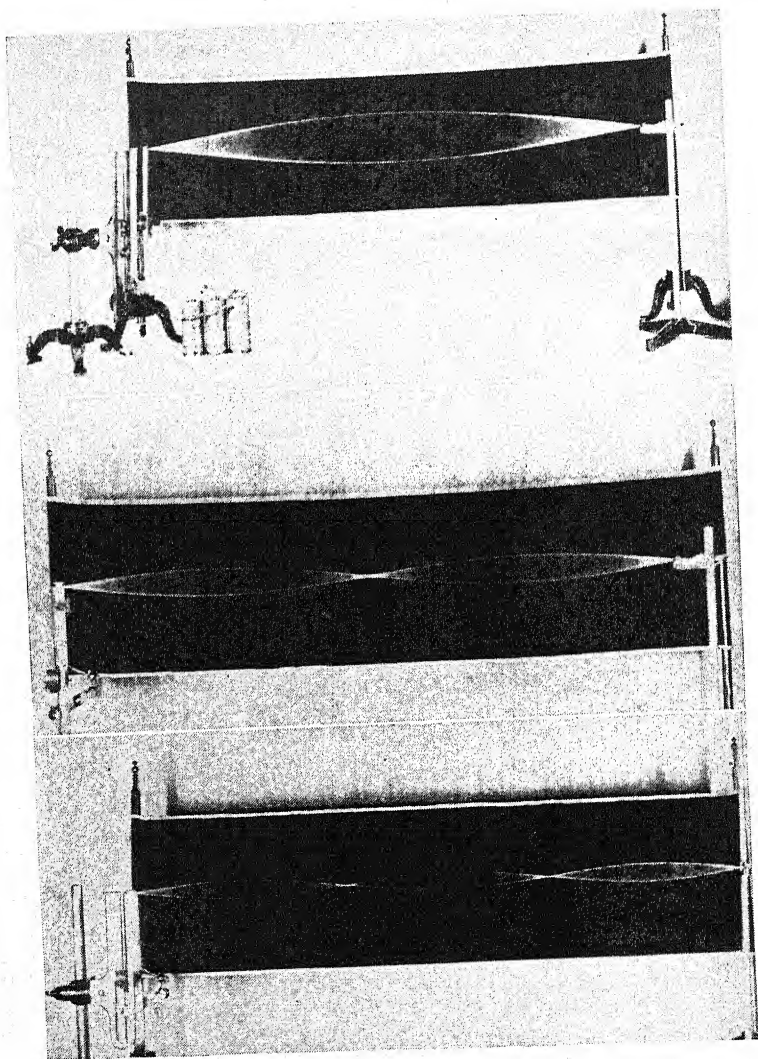
The two vibrations represented have the same frequency, but differ in amplitude.

principal factor in determining the loudness or intensity of the auditory experience. When sounds are loud, it is probable that a larger number of fibers are discharging impulses in the auditory nerve.²

c. Timbre. Tones of the same pitch emanating from different musical instruments have a characteristic distinguishing mark which enables the listener to tell whether the note is being played, for example, by a piano or a violin. This distinguishing characteristic of tones is known as *timbre*. It is the awareness of timbre which permits the blind to ascertain what person is speaking, as individual voices differ in this respect. Timbre depends upon the number, the pitch, and the relative intensity of the overtones. When a string vibrates, it not only vibrates as a whole but in halves, thirds, fourths, fifths, and so on. The string as a whole produces the fundamental; the sections, the overtones (partials). If you play a note on the piano, you will hear the fundamental, and, after

¹Consult E. G. Wever and C. W. Bray: "The Nature of Acoustic Response: The Relation between Sound Frequency and Frequency of Impulses in the Auditory Nerve," *Journal of Experimental Psychology*, 1930, 13, 373-387.

²For an exhaustive account of modern views on hearing, see E. G. Boring: "Auditory Theory with Special Reference to Intensity, Volume, and Localization," *The American Journal of Psychology*, 1926, 37, 157-188.



The wave forms of a string in vibration as a whole, in halves, and in thirds.
The vibrations are generated by a tuning fork.
(Photographs reproduced by permission of Dayton C. Miller of the Case School
of Applied Science.)

practice, you can detect the overtones in addition. It is the nature of the overtones which determines the timbre.

d. Consonance. Another auditory experience is that of *consonance* or harmony. The harmonizing notes constitute a melodious blend pleasing in its effects, while a note off key shatters the nerves brutally. Consonance, of course, is a *Gestalt*, a total pattern, which comes as a unitary experience. Harmony depends not only on the way the fundamental tones fit together, but also on the teamwork of the various overtones.

e. Tonal Islands. Corresponding to color blindness in vision is the phenomenon of *tonal islands* in hearing. Some persons are deaf to certain portions of the scale while they remain sensitive to notes in the other regions. The range of hearing is greatly reduced in approaching senescence, causing deafness at both extremes of the auditory scale.

2. The Hard of Hearing. Often, children with defective hearing are kept in the same grade year after year because their teachers, not realizing their condition, think they are dull, according to 7500 tests of hearing¹ given to the children of the Holyoke, Massachusetts, schools.²

Defective audition may have some compensations. Thomas Edison, for example, found his deficiency a distinct advantage as far as his work was concerned, since he was free from auditory distractions when he wanted to concentrate his attention upon the task in hand. Edith Katz, in charge of vocational guidance for the New York League for the Hard of Hearing, usually discourages ambitions among the clients which involve contact with the public. There are trades, she points out, in which the hard-of-hearing worker has an advantage, notably where

¹Auditory acuity may be tested by an audiometer, an instrument which enables the experimenter to vary the intensity of the sound with a high degree of accuracy.

²The Boston *Sunday Herald*, June 30, 1935.

concentration in the midst of noise is important, such as proofreading, research, typing, bookkeeping, auditing, and statistical work. Miss Katz's card, designed for the prospective employer, sums up the case for the hard-of-hearing employee in this way:

He appreciates your efforts in training him, therefore he sticks to the job. He cannot waste time in idle chatter, therefore he accomplishes more. He is accustomed to monotony and isolation, therefore makes an excellent routine worker. He must substitute eyes for ears, therefore he has highly developed powers of observation.¹

A person who is hard of hearing is under some strain in trying to understand conversation which he hears imperfectly, and the tension involved may result in exhaustion and irritability. People who are partially deaf do not receive the social considerations accorded to the blind because deafness is not so obvious a handicap. There is often some hesitation in resorting to mechanical devices to aid in hearing because the individual does not desire to advertise his deficiency. Out of pride, he is inclined to forego the advantage of a hearing-aid. Thus, he is deprived of the social contacts so important for the maintenance of a normal personality.

Deafness has very serious effects upon the psyche, as may be seen in this letter written to Dr. S. Parkes Cadman:

I am as deaf as a post, lonely, sad, with a lot of things I would like to say, but few care to talk to me, and they are not always near when I need them. I am getting disheartened, and at times I know I am cranky. What shall I do to avoid being sour and repellent?

Social intercourse is subject to friction where a deaf person is involved. When you talk to an individual who is hard of hearing, you begin in a normal tone because you do not

¹Russell Owen: "Hearing with Eyes," *The Forum*, August, 1937.

want to embarrass him. He does not "let on" that he is missing most of what you are saying, but his irrelevant reply to your statement makes it evident that he is at sea. So you shout at him. Whenever you are angry, you express your temper by raising your voice. In reverse, when you shout you find yourself growing angry, in spite of any effort to maintain your mental poise. Your irritation is contagious, producing a state of annoyance in the listener.

Furthermore, you cannot impart a secret where you have to bellow each word, unless you have retired to the wide-open spaces. Hence no intimacy can be cultivated at social functions. It is embarrassing to converse with a deaf person at a public gathering because your stenorian tones inevitably evoke the attention of all those present. It is no wonder that a person whose hearing is defective finds himself a social nuisance. Beethoven was forced to endure an ostracism that afflicted him very deeply. He wrote to a friend:

I am living in misery. For two years I have been avoiding people almost entirely, because it is not possible for me to tell them that I am deaf. . . . In whatever way possible I will defy my fate, but there will be moments in my life when I will be the most unhappy of God's creatures.¹

A common trait in the deaf is suspiciousness. Since a voice of normal tone sounds like a whisper to the individual who is hard of hearing, he comes to believe that people are plotting against him—otherwise, why should they lower their voices? Consequently, he is inclined to develop delusions of persecution.

3. The World of the Deaf. The person with normal hearing does not realize to what extent audition is dependent upon the other senses. Lip-reading by sight,

¹Emil Ludwig: "Beethoven," *Hearst's International-Cosmopolitan*, December, 1928.

for example, facilitates the auditory process. This fact may be realized if you notice how much more difficult it is to catch sounds accurately over the telephone, where the visual clues are lacking. The deaf person merely takes advantage, to an extraordinary degree, of the sensory cues employed by all of us.

Gault is conducting a research to determine how far the sense of touch can be employed to detect the tactual qualities of objects that are in vibration. Both hearing and touch are receptors for vibratory stimuli.¹ Where the auditory mechanism is defective, therefore, the logical sense to train is touch. Gault has found the tactual capacities surprisingly acute. He defines the aims of his program to be:

(1) to find what characteristics of speech can be detected through the skin—through the sense of touch; (2) to find to what extent these felt characteristics of speech can be made use of to aid the deaf—in receiving and interpreting speech—and in improving their own art of vocal expression, or spoken language.²

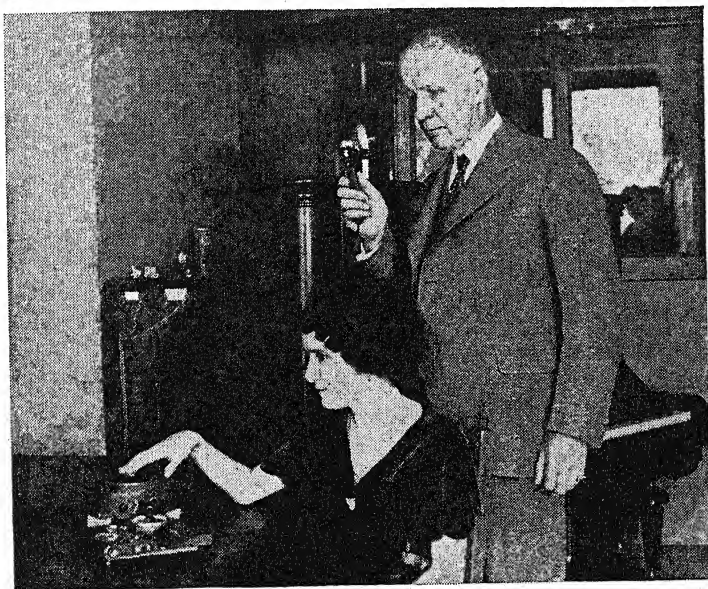
The acquisition of speech is dependent upon hearing. We learn to speak by hearing ourselves talk. Gault's experiments have demonstrated that when deaf subjects feel speech in their fingers through the teletactor and, at the same time, see it upon the face of the speaker, the combined tactual-visual impression enables them to interpret speech more fully and accurately than does the visual impression alone, as in straight lip-reading.³ In the experiments with "listening fingers," spoken language is transmitted through a microphone and a specialized am-

¹L. D. Goodfellow: "The Sensitivity of Various Areas of the Body to Vibratory Stimuli," *Journal of General Psychology*, 1934, 11, 435-440.

²R. H. Gault: "Studies on the Psychology of Touch," *Carnegie Institution Year Book*, 1927-1928, 27, 401-407.

³R. H. Gault: "On the Effect of Simultaneous Tactual-visual Stimulation in Relation to the Interpretation of Speech," *The Transactions of the Illinois State Academy of Science*, 1930, 22, 630-653.

plifier into a vibrating unit. By resting the fingers upon this unit the "listener" feels the vibrations generated by the speaker's voice. In this situation the deaf find an approach to the study of spoken language. With the aid of amplification the vibro-tactile organs are able to detect the frequencies of vibration involved in human speech that lie between 64 vibrations per second and 8,192 per second.¹



"MAKING THE DEAF TO HEAR"

Dr. Robert H. Gault of Northwestern University, Evanston, Ill., testing his "teletactor." He speaks through the microphone while Miss Helen May Martin, 34 years a blind deaf mute, listens through her finger tips by means of vibrations. She has learned to play the piano.

(By permission of the Keystone View Company of New York, Inc.)

The use of gesture is widely resorted to by the deaf for the communication of thought. A child of deaf-mute

¹R. H. Gault: "Implications of Vibro-tactile Phenomena," *The Transactions of the Illinois State Academy of Science*, 1935, Vol. 28, No. 2.

parents, Lon Chaney¹ trained his face and fingers and his whole body to tell stories to his mother when she became afflicted with rheumatism. All his life afterward he was more talkative with his muscles than with his voice. "People remark on the expressive hands of Lon Chaney; they marvel at the delicate shades of meaning the great pantomimist can put into subtle little gestures; but few realize that the genesis of this uncanny art was the bedside of that sick mother."²

4. Psychological Effects of Sounds. Music has an extraordinary capacity for stirring the soul, for arousing the emotions, for swaying the moods. A military march can carry patriotic fervor to a high pitch.

While music has its charms, too much of it can upset the mental balance. Continuous assault upon the ears is a trying punishment which a human being can hardly be expected to endure. A murder is committed now and then under the stress of the unabating pandemonium which the invention of the phonograph and the radio has made possible. A man in Watertown, South Dakota, became so enraged when one of his two stepsons persisted in tuning in the radio, disobeying his orders to turn it off, that he arose from bed, took his shotgun, and slew the offender. Of course the radio may merely have offered him an excuse for an act he had long contemplated, but the circumstances in the case do not make that supposition likely. A fifteen-year-old boy was killed by his stepfather in New York for playing the phonograph against the parental will.

Sound, too long continued, is torture—more especially if the sound takes the form, not of music, but of noise. In our day, the two may be easily confused, but none the

¹Lon Chaney was an actor in the silent motion pictures who starred in such productions as *The Hunchback of Notre Dame* and *The Phantom of the Opera*.

²*The Literary Digest*, September 13, 1930.

less we endure more noise than we should. The noises of civilization levy their toll on the nervous system. It has been estimated that we expend forty per cent of our energy in resisting the clatter of city life. If we were more intelligent, we would refuse to tolerate it. Our capacity to adapt ourselves betrays us. We do not realize how the incessant racket saps our vitality. Campaigns are under way in London, New York City, and other cities to insure silence during the night hours. There are still those who feel like Schopenhauer when he wrote that "the superabundant display of vitality, which takes the form of knocking, hammering, and tumbling things about, has proved a torment to me all my life long."¹

C. Touch. The skin is the organic basis for the sense of touch. It would be difficult to estimate the importance of tactual sensations in the process of knowledge. It is through the sense of touch that we become most intimately acquainted with the objects in our environment. Sight and hearing convey impressions from stimuli at a distance; touch requires contact.

The average person thinks that his skin is sensitive over its whole surface but careful experiment indicates that it is sensitive only in spots—the distribution is punctiform. By applying the appropriate stimuli, four different kinds of cutaneous sensations may be evoked: pressure, cold, warmth, and pain. All other tactual experiences, such as wetness, smoothness, itch, and tickle, are variations or combinations of these elementary sensations.

1. Pressure. If you apply a boar's bristle to the skin, you will discover that the stimulus is not perceived at all points of the surface but only at some. These spots where a sensation of pressure is aroused are known as pressure spots. That the distribution of sensitivity is punctiform may be confirmed by employing an æsthesiometer, an

¹Arthur Schopenhauer: *Essays*, p. 447. Home Library.

cutaneous

instrument resembling a compass, having two sharp points which may be adjusted to various distances apart. Applying the *æsthesiometer* with the points very close together, the sensation is of one point and not two. Investigation will show that the points must be a certain distance apart before they will be felt as two. This distance is known as the two-point limen, and it differs on various parts of the bodily surface. Find the limen for



AESTHESIOMETER

Measuring the two-point limen on the back of the hand. The subject reports whether she feels one point or two.

the finger tip, using a hairpin if no *aesthesiometer* is available, and apply the points to the back of the neck. The finger tip will give the sensation of "two," the neck, the sensation of "one."

It should be noted that the skin itself is not the receptor for touch; the receptors are specialized organs in the skin. The pressure spots on the hairy surface of the body are located to the windward of the hairs. The nerve endings around the hair bulb pick up the mechanical effects com-

municated to the hair by the stimulus. The usual stimulus in experimenting on pressure sensations is a boar's bristle.

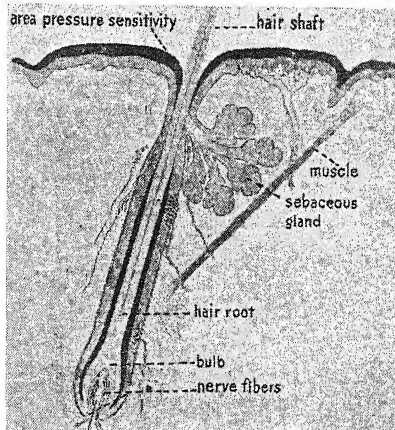
The number of pressure spots tends to increase toward the extremes of the limbs. The finger tips are particularly sensitive.

Adaptation to pressure is a familiar phenomenon—the professor looking for his glasses which are on his forehead is a proverbial illustration.

2. Temperature.

Temperature is perceived through two distinct sets of receptors which render possible the experience of cold and the experience of warmth respectively. The cold spots may be located by applying a rod dipped in cold water, the warm by a rod dipped in warm water. The exact receptors for cold, as for warmth also, have not as yet been definitely ascertained.¹ The accepted theory of skin sensation, which holds that each of the warm, cold, pressure, and pain spots is capable of feeling only its own kind of sensation, must be revised in the light of experiments performed by Heiser, reported in 1932.²

Heiser's work seems to show that first of all there is not such a definite location of the spots as has been supposed,



HUMAN HAIR

¹K. M. Dallenbach: "The Temperature Spots and End Organs," *American Journal of Psychology*, 1927, 39, 402-427.

²F. Heiser: "Stimulus, Temperature, and Thermal Sensation," *Archives of Psychology*, 138, 1932.

because when he varies the temperature of the metal point touching a spot, or its pressure, the positions of the spots change. Under the usual theory the feeling of warmth is due to the actual raising of temperature of the hot spots on the skin. But psychologists have suspected this theory because they have been able sometimes to get sensations of heat without the use of warmth. Heiser first found that if the temperature of the metal point is raised, more spots can be found than with lower temperature. He found also that more pressure increased the number of spots. He changed the time of holding the metal point on the skin, while temperature and pressure remained constant. One might expect increasing reports of warmth with increasing stimulus-duration but experiments showed that the prolongation of the stimulus-duration does not produce a significant change in the number of sensations of warmth within the areas tested; whether the contact lasts a half-second, or four whole seconds, makes no differences in the sensation of warmth. This, he concludes, means that the sensation of warmth includes something besides heat, for half a second with the point he employed is too brief a time to deliver heat. With hypodermic needles under the skin he discovered that in the half-second there was actually no rise in the skin temperature even though the sensation of warmth was felt. A longer application of the stimulus causes the surface temperature of the skin area involved to rise slightly during the period of stimulation. Although the adequate stimulus for the sensation of warmth may be an increase in the temperature of the sense organ, the increase is probably not caused by conducted heat from the stimulus but may be due to circulatory reactions.¹ These experiments indicate the possibility of some other organiza-

¹F. Heiser: "Stimulus-Duration and Sensations of Warmth," *American Journal of Psychology*, 1937, 49, 58-66.

tion of receptors than that of hot, cold, pain, and touch spots. Heiser's data show that the present knowledge of tactual sensation is still very limited.

Although the bodily temperature remains very constant in normal health, the temperature of the skin varies more widely. The psychological zero above which a stimulus will be felt as warm and below which a stimulus will be perceived as cold shifts with the temperature of the skin. Berkeley's famous experiment in temperature adaptation will serve as an illustration. Fill three basins with water as follows:

Hot

Neutral

Cold

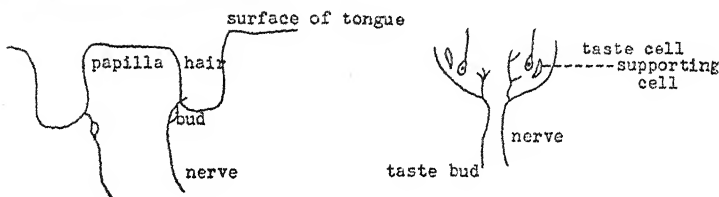
Place your left hand in the hot and your right hand in the cold for a minute, then plunge them both into the water of neutral temperature. The water will feel cold to the left hand and warm to the right. Berkeley's question is worth speculating on—if the water feels cold to one hand and warm to the other, which is the water, actually, cold or warm?

3. Pain. Pain is an elementary cutaneous quality like pressure, warmth, and cold. When it is mediated by the free nerve endings of the skin, the stimulus is usually of extreme intensity—such as the prick of a pin, extreme heat, extreme cold, or a blow, cut, or injury of any type to the skin tissue. There are sensory nerve endings, also, in the subcutaneous tissues where dull pain may be experienced even when the skin is anesthetized.

D. Taste. The sense of taste acts as a custodian for the stomach by inspecting all food upon its entrance into the alimentary canal. To make the process of selection doubly sure, the sense of smell coöperates as a further check. Few persons realize how much of the gustatory experience is really olfactory.¹ When you have a cold,

¹See A. F. Blakeslee: "A Dinner Demonstration of Threshold Differences in Taste and Smell," *Science*, May 24, 1935.

food tastes flat, partly because you cannot smell it. Stuff your nostrils with cotton and blindfold yourself and you won't be able to tell whether you are eating a piece of apple or a piece of onion. If you do not enjoy cod-liver oil, hold your nose and you will not notice the taste. The elementary taste qualities are sweet, salt, sour, and bitter. More complex gustatory experiences are combinations of some of these four qualities.

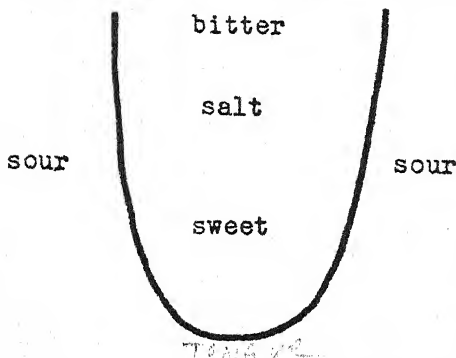


The organs of taste are the buds found in the papillæ of the tongue chiefly. In children the papillæ are also in abundance in the mucous membrane of the cheek as well, explaining why children like to take big bites. Adults sometimes take big bites, but not with the same physiological excuse.

There are several buds in a papilla, each taking care of its appropriate quality.

A substance must be soluble to taste at all. The solution descends into the depressions in the surface of the tongue, where the hairs detect the stimulus and transmit the impression to the bud in the papilla.

Taste is distributed on the tongue as shown in the diagram above. You like to lap lollipops and ice-cream cones



because the buds for sweet are situated at the forward end of the tongue.

Adaptation may occur in taste. A subject carried a strong solution of brine in his mouth all morning. His lunch tasted flat, as well it might. If you become adapted to sweet, the sour components will stand out by contrast.

The sense of taste has possibilities that are not capitalized by the usual human being because it is considered shameful to glory in the pleasures of the stomach. The Epicure cultivates the gustatory consciousness so that food not only provides sustenance for his physical survival, but nourishment also for his spiritual welfare.

How much taste can be relied upon as a guide to diet is a big question. "Eat what you like because if you like it, it's good for you" may or may not be wise counsel. Certainly a child would feel that this was a more rationally governed universe if spinach and cod-liver oil tasted as pleasant to him as candy or ice cream. Indeed, we are apt to follow our whims in regard to food—reactions which are conditioned in various ways—by the manner of service, remarks of others at the table, or the state of the stomach at the moment. Habit is such a powerful factor that if we have eaten food a certain way several times we must always have it prepared that way or we are annoyed beyond endurance.

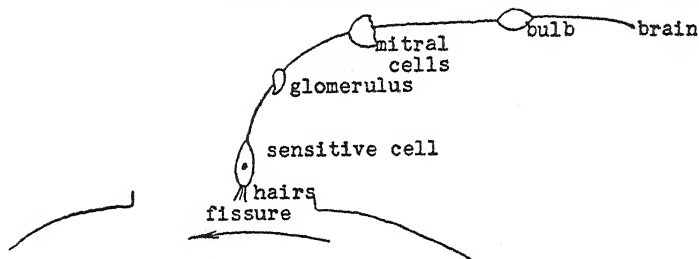
The sense of taste is highly developed in professional tasters who sample tea, coffee, wine, and other beverages to determine whether they satisfy certain standards. Tea experts find the flavor of tea may be brisk, full, rich, thick, insipid, grassy, fishy, smoky, flavory, harsh, metallic, acrid, puckery, toasty, malty, or brassy. Coffee tasters describe the beverage as harsh, soft, sweet, sour, acid, winy, earthy, or hidey (tasting of hides).¹

E. Smell. The sense of smell, the advertisers con-

¹*The Literary Digest*, December 5, 1936.

stantly remind us, is assuming a new importance in human behavior. Odors exert a subtle influence upon our attitudes. It has been found that a house is more salable if it is permeated with the odors of varnish and fresh paint.¹ Silk stockings attract the purchaser more readily if they are slightly perfumed. The sales of glues, raincoats, and oilcloths have been increased by the inclusion of a little perfume in the manufacturing process. A fire insurance company promoted its sales program by using stationery emitting a smell of wet, burned wood.²

The nostrils provide a channel for the air currents involved in respiration, steering them into contact with the sense receptors. The stimulus for smell must be gaseous,



just as the stimulus for taste must be soluble. If you were so careless as to empty a bottle of eau de Cologne down your nostrils, you would not smell it.

The olfactory fissure is above the direct respiratory tract, thus protecting the receptors from foreign substances by exposing the sensitive cells only to eddies of air inspired and expired. The glomerulus, mitral cells, and bulb serve to "step up" the stimulus, to increase the sensitivity for odors.

¹See D. A. Laird: "How the Consumer Estimates Quality by Subconscious Sensory Impressions: With Special Reference to the Role of Smell," *Journal of Applied Psychology*, 1932, 16, 241-246.

²See M. T. Bogert: "Your Nose Knows," *Scientific Monthly*, 1934, 39, 345-353.

Odors are aroused by chemical stimuli. It is difficult to investigate smell for various reasons.¹ Adaptation to smell is very rapid so that the stimulus is no longer sensed after a minute or so. Extraneous odors must be eliminated. Language is woefully inadequate for describing olfactory experiences, since reference to smell is barred from ordinary conversation.

Henning took a few trained observers on smell excursions through the zoos and other resorts. On the basis of his experiments he finds six elementary smell qualities:

Fragrant	Ethereal
Spicy	Putrid
Resinous	Burned

All other olfactory experiences are complexes of these.

Synthetic perfumes are made on the principle that two stimuli may fuse to form a new quality. Two different odors may exist simultaneously. Odors can be analyzed from a pattern as notes from a musical chord. Two odors may act antagonistically to weaken each other—Peruvian balsam and iodoform. Two odors may enhance each other—strychnine sensitizes the sense organ for odors that follow.

Perfume manufacturers employ expert smellers who check on all the materials that are used in securing the proper odor. One method of testing perfumes is to dip a blotter in a mixture prepared by adding water and alcohol to the perfume. The blotter is aired for a day or two before it is submitted to the expert for examination. Blends are sought which will produce scents noted for "roundness" or "sharp tang."

We have now covered the traditional five senses—vision,

¹See A. F. Blakeslee: "Demonstration of Differences between People in the Sense of Smell," *Scientific Monthly*, 1935, 41, 72-84.

audition, touch, taste, and smell. In addition to these five, there are a number of other senses, only some of which we shall find time to discuss.

F. Thirst, Hunger, and Appetite. Thirst is due to a disagreeable dryness of the mouth and pharynx accompanying a general deficiency of water in the body. Whenever there is a shortage of water, the percentage in the blood remains fairly constant at the expense of the salivary glands. When the salivary glands are artificially stimulated by means of pilocarpine, rabbits refuse water entirely or barely touch it even after they have been deprived of it for seven days. Thirst is a local sensation of dryness caused by a deficient flow of saliva.

The sensation of hunger is due to rhythmical contractions of the stomach walls. These contractions are aroused locally and are not due to a deficiency of food in the blood. The contractions have been registered by sinking a balloon in the stomach, with an attachment to the outside for recording the alternating pressures. Hunger is experienced when the diminished bulk in the stomach causes the walls to contract. It is not due to distress over lack of nourishment for the tissues. The contractions occur, in part, as a conditioned response. When the customary meal hour arrives, starvation is experienced because the contractions are conditioned to occur at that time of day. If the meal is postponed for a few hours, the hunger will ultimately disappear.

Appetite is another matter. Appetite is a desire for a repetition of a previously experienced pleasantness. You start a meal because of hunger. You eat enough to satisfy your hunger before you get to the dessert, but you do not stop. You eat the dessert because you know it will taste good. Cafeteria owners capitalize the urge of appetite by displaying the desserts first in order, because the customer will be certain to buy a dessert at that stage,

while he might ascetically leave it off a full tray at the further end of the march.

G. The Kinesthetic Sense. It is by means of kinesthetic sensations that the movements of our own members are appreciated, involving the muscles, tendons, joints, and skin. The muscle spindles and corpuscles of Golgi are the chief sense organ structures, being classified as proprioceptors. When you go into a dark room and reach for the light chain, you guide yourself by kinesthetic cues. In learning any game of skill the kinesthetic sense is highly important for getting "the feel" of the correct motion. In golf or tennis it is difficult for the beginner to master the proper swing. Showing the pupil how you do it is of limited value. It is far more effective to let him make the swing while you guide it through the right arc. Such a procedure gives him the "feel." The expert is one who notices how it "feels" to make a good stroke and then on the basis of that "feeling" can produce another stroke of the same kind. A short pitch to the green in golf requires a mastery of kinesthetic cues—to swing through the correct arc and with just the right amount of momentum. To put a ball in a cup four hundred yards away in four strokes is a tribute to human skill, and to the marvel of the kinesthetic sense.

H. The Sense of Equilibrium. In the internal portion of the ear are located the semicircular canals, the utricle and the saccule. These structures have nothing to do with hearing but are the sensory structures which enable a person to judge the position of the body in various planes. Lymph is contained in each of these organs with openings communicating from the utricle to the saccule and from the saccule to the cochlea.

Change of rotational motion is sensed by the semicircular canals. The experience of rotation is dependent primarily upon changes in the spontaneous activity of the

crista "hair cells" which project into the ampulla. These cells are continuously active, setting up repetitive discharges of nerve impulses.¹ The spontaneous activity-patterns of the crista are modified but not initiated by the rotation of the animal. The synchronous beating of the hair cells may impart a mechanical stimulus to the sensory nerve endings. Upon the basis of such cues equilibrium is maintained.

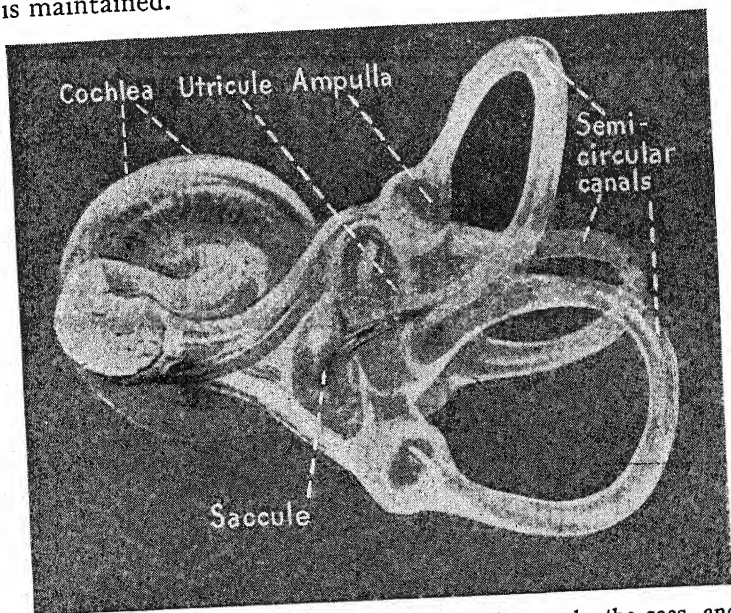


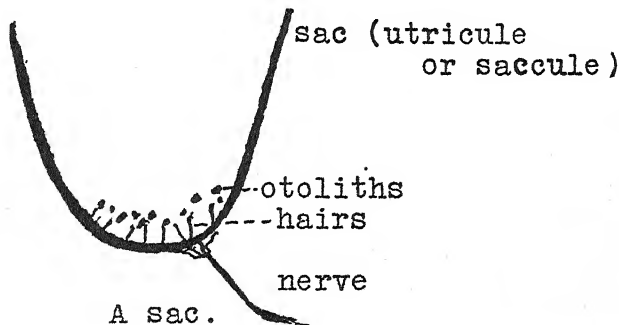
Diagram showing the relation of the semicircular canals, the sacs, and the cochlea. Note that the semicircular canals lie in three different planes.

Many of our adjustments depend upon a correlation of several senses. Visual sensations and cues from the semicircular canals combine to give an accurate maintenance of equilibrium. The role of the eyes may be discovered by trying to walk on a line on the floor, watching the feet

¹H. Hoagland: *Pacemakers in Relation to Aspects of Behavior*, pp. 138ff. 1935; Also "Some Pacemaker Aspects of Rhythmic Activity in the Nervous System," *Cold Spring Harbor Symposium*, 1936, 4, 267.

through the wrong end of a pair of opera glasses. The feet should be planted in a direct line, one in front of the other, in walking. The distortion of the visual cues by the opera glasses, causing the floor to look farther away than it really is, upsets the equilibrium.

Non-rotatory movement is sensed by the utricule and saccule. When a train comes to a stop, you have the experience of moving backward. When you start suddenly forward, the otoliths (particles of calcium carbonate), through inertia, are left behind and when you stop quickly, the otoliths keep on going. When you are at rest the otoliths inform you of your upright position by pressing on the hair cells; when you are standing on your head, the pressure of the otoliths is released. (See diagram below.) Of course kinesthetic and visual cues coöperate with the sensations from the sacs to keep us informed on our bodily position.



When a crayfish sheds his shell, sand particles get into his otocysts, serving the same function as the otoliths in the human sacs. Kreidl inserted iron filings and then waited for the shell to form. After the shell had formed, he placed a magnet over the crayfish, drawing the iron filings off the hairs. The crayfish, sensing it was upside down, turned upside down to bring itself right side up, so that it

was really right side up even when it thought it was upside down. In reading this description you are confused—so was the crayfish.

If a section of a semicircular canal is removed in a pigeon, his balance is seriously disturbed. The alcoholic gait is due to the effect of the narcotic upon the canals—as well as to the effect upon the nerves which control the muscular coördinations in accordance with the cues received from the canals and the eyes. Deaf mutes are frequently defective in the sense of equilibrium because their sensory apparatus is impaired. A deaf mute on a merry-go-round is as apt to lean outward as inward in rounding the curve—with disastrous results.

SUMMARY

Protoplasm possesses a characteristic irritability which leads it to respond to a variety of stimuli, whether it be the protoplasm of a unicellular or a multicellular organism. As bodily organization increases in complexity, irritability becomes more specific, being delegated to special sense organs. We have reviewed some of the kinds of experience to which we, as human beings, are subject by virtue of our various receptors. The range of experience and the varieties of experience are both dependent upon the nature of our sensory equipment.

The traditional five senses of vision, audition, touch, taste, and smell have been described, supplemented by thirst, hunger, appetite, kinesthesia, and equilibrium. Special stress has been laid upon the relationship of the structures of the various sense organs to the kinds of experience they mediate. Attention has been directed to the significant role played by the receptors in enabling the individual to adjust himself successfully to his environment.

THE NERVOUS SYSTEM

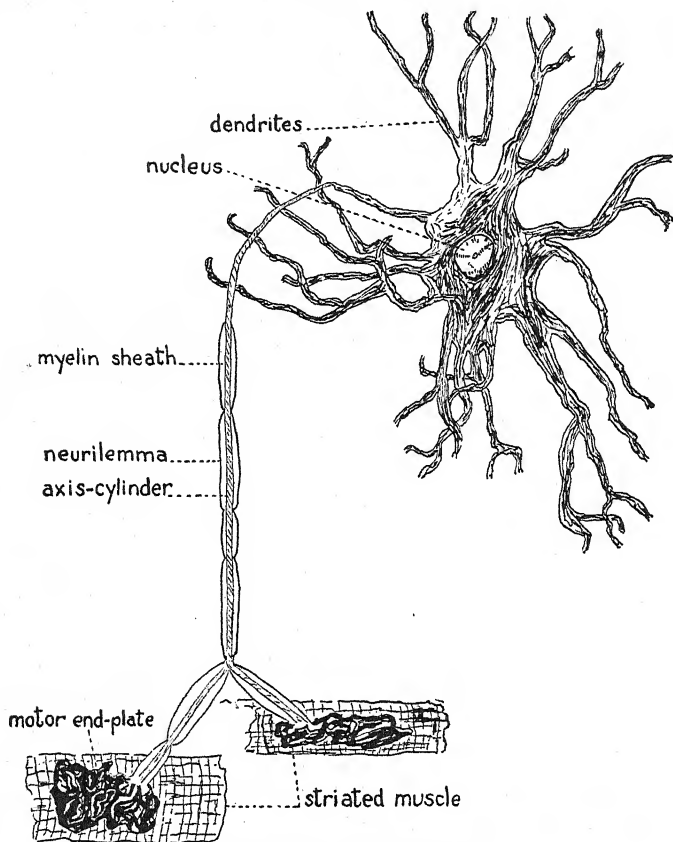
AN UNDERSTANDING of the nature of man, of his experiences and reactions, necessitates a careful study of the structure and action of the nervous system. In this study we shall discover how the nervous system makes possible the remarkable coördination involved in the reaction of the human being to his environment; how vital needs are effectively met by means of man's complicated adjustments to external stimuli, and by his reactions to conditions within his own body.

We have already noted how stimuli are selected by the separate sense organs and translated into nerve impulses. The link between the receiving organ and the organ of response (muscle or gland) is furnished by the nervous system. Nerve impulses, in other words, are conducted from the "receptors" by incoming, or sensory nerves, to that complicated system of nerve connections called the "brain," where the impulses are sorted and distributed by means of outgoing, or motor nerves, to those muscles and glands which respond in an appropriate manner.¹ Here we will describe the most important nerve structures and trace their functions. Thus we may appreciate more clearly how behavior is actually carried out.

I. NEURONS

The unit within the nervous system is the separate nerve cell, called the *neuron*. There are many kinds of neurons,

¹Sensory (incoming) nerves are sometimes called afferent nerves; and motor (outgoing) nerves, efferent.



ONE TYPE OF NEURON

all with certain characteristics in common. The structure and function of the neuron must be grasped if we are to comprehend how the nervous system works. Each neuron consists of:

- a. cell body
- b. axon
- c. dendrites

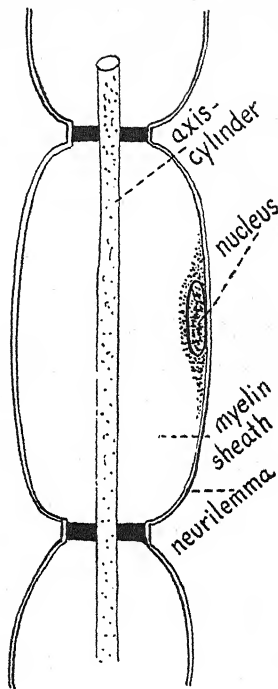
The nerve fiber resembles an insulated cable, the neurons being enclosed in one or more sheaths.

SCHEMATIC ENLARGEMENT OF A PORTION OF AN AXON TO ILLUSTRATE THE STRUCTURE OF A NERVE FIBER (AFTER CAJAL)

Most of the nerve fibers in the body possess the medullary (myelin) sheath. There is some evidence that this sheath facilitates conduction and takes some part in the chemical processes involved. The neurilemma, another sheath, fits over the myelin sheath. This sheath is the only one on nonmedullated (autonomic*) fibers; there is no neurilemma around the nerve fibers within the brain and the spinal cord. The function of the neurilemma is unknown.

The cell body has a number of important functions. One of the main functions is that of nutrition. The entire neuron dies if the cell body is destroyed. Recent evidence, moreover, attributes a number of other important functions to the cell body. It is extremely important in the process of conduction of impulses, when the cells discharge rhythmically.

*Referring to the autonomic nervous system, which regulates the visceral processes.



II. SOME ELEMENTARY FACTS ABOUT NERVOUS FUNCTIONS

A. The Polarity of the Neuron. The *dendrites* are short stubby structures which spread out into numerous branching processes. The branches pick up impulses which are conducted by the dendrite toward the cell body.

The *axon* is a slender outgrowth from the cell body. There is usually only one axon to a cell body. The axon is to be distinguished from the dendrites by its straighter course, its uniform diameter, and its smooth outline. The axon on ending usually splits up into a terminal brush. These brushes always end:

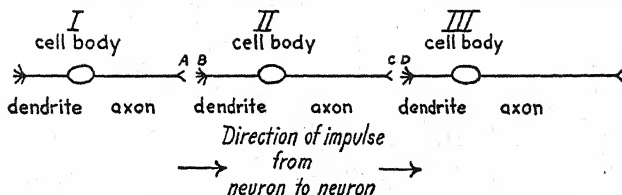
- a. around the dendrite of another neuron, or
- b. in a muscle, or
- c. in a gland.

H... 1st, 2nd & 3rd ...

Within the neuron the nervous impulse may pass in both directions. Where more than one neuron is involved, as is always the case in any coördinated activity, we may say, for practical purposes, that the axon conducts the impulse away from the cell body, in contrast to the dendrites which conduct the impulse toward the cell body. The dendrites receive the impulse and the axon discharges it—this is what is meant by the polarity of the neuron. The dendrite is the way in and the axon is the way out.

While the neuron is a structural unit in itself, neurons can only function when connected in chains. In order to understand why the impulse travels only in one direction through the chain we must examine the synapse.

B. The Synapse. The synapse is the connection between two neurons, i.e., the place where the axon of one neuron comes into physiological relation with the dendrites of another neuron. Physiologists have found that the threshold for large fibers is lower than the threshold for small fibers, or, in other words, that the large fibers can be more readily stimulated than the small fibers. The terminations of the axon are always smaller than the dendrite with which it makes a synaptic connection. Consequently, the axon may stimulate the dendrite, but



The impulse passes from neuron I to neuron II, and from neuron II to neuron III. Within neuron II, for example, the impulse may go either from B to C or from C to B. It can never jump from B to A, however, for the synapse acts as a valve so that the impulse cannot pass from dendrite to axon across the gap. The impulse can pass from C to D, from axon to dendrite. Whereas the impulse thus moves in both directions within the neuron, interneuron conduction or synaptic conduction, as it is called, can only be in the forward direction.

never the reverse. This produces the one-way effect.

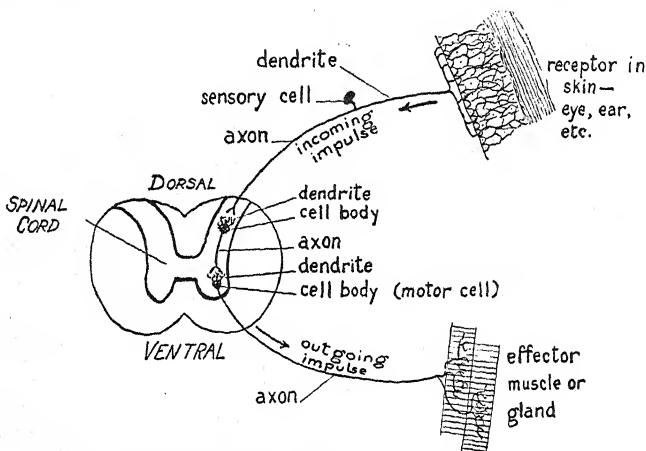
C. The Law of Forward Conduction. The synapse acts as a valve, allowing the impulse to travel only from axon to dendrite across the gap. The nervous impulse can never pass in the reverse direction from the dendrite to axon across the synapse.

D. The Reflex Arc Hypothesis. The reflex arc hypothesis has been advanced as a theory for helping us to understand how the nervous system functions in coördinating the activities of the organism. According to this hypothesis, the reflex arc, reduced to the simplest terms, takes care of the stimulus which has been received by a sense organ, conducting the impulse to the spinal cord and then out again to a muscle or gland, thus leading to a response appropriate to the stimulus. The reflex arc in actuality is a very complex affair, involving the selection of proper channels from a number of possible pathways. Organized acts would be impossible if the distribution of the outgoing impulses were haphazard. As a matter of fact, the distribution is selective, that is, only the pathways are traversed which lead to the effectors appropriate for carrying out an effective response to the stimulus.

The reflex arc may be illustrated with a spinal frog—a frog which has been beheaded. Activities are organized by the cord in the case of the spinal animal. If you pinch the frog's leg with a pair of forceps, the leg is immediately drawn up to escape the irritating stimulus. The stimulation of the skin leads through the arc to the appropriate behavior in response. The act occurs automatically, that is, it is a reflex.

Many of our vital processes are carried on without our attention, being effectively directed by the thalamus or lower centers. Such reflex activities are intelligent in the empirical sense of the word since they efficiently accomplish ends of real biological value. Since the decerebrate

animal responds to stimuli in a sensible fashion, for example, moves to avoid a disagreeable object, one is forced to admit that the thalamus and lower centers exhibit the same organizing genius as the brain, only to a less degree.¹



SCHEMATIC DIAGRAM OF A REFLEX ARC

The reflex arc is a "convenient abstraction," rather than an exact account of what takes place in the nervous system. Isolated or single reflex arcs do not occur. In every instance the reflex is incorporated in a complicated pattern of neural action.

A number of human reactions resemble reflex action. A well-known example is the knee jerk (*patellar reflex*). While the subject is in a sitting position with his legs crossed, a blow just beneath the knee cap will make the foot kick.

Other responses of an automatic nature include:

Hiccoughing	}	under the control of the medulla
Sneezing		
Snoring		
Yawning		
Vomiting		
Shivering—		under the control of the thalamus

¹For an interesting passage on this question, see Morton Prince: *The Unconscious*, pp. 240-245. 1914.

Some reflexes lie outside the realm of conscious control, others are sometimes controllable. If somebody threatens your eyes, it is well nigh impossible to avoid blinking. Hiccoughing is so difficult to stop of your own volition, except by the supplementary aid of drinking, that it sometimes precipitates a panicky feeling, especially as you recall the case of the man you read about in the newspaper, who hiccoughed steadily for weeks. Sneezing is also hard to control.

The earliest nervous reactions, according to the modern point of view, are total responses of the organism as a whole. Separate reflexes come later. Even a simple response to a stimulus is not a reaction of a part of the body to a particular aspect of the environment. It is an integrated bodily reaction to the total situation in which the stimulus is presented. The response is a unitary behavior pattern involving the whole organism.¹

E. Coördination. Reflex activity is not a general convulsion but an orderly affair. How is such organized behavior made possible? There are various means by which this end is attained.



**EXPERIMENTAL APPARATUS FOR
DEMONSTRATING THE
PATELLAR REFLEX**

(Used by permission of D. A. Laird.)

¹See C. J. Herrick: *Introduction to Neurology*, pp. 72-80. Fifth edition, 1931.

1. The Final Common Path. There are about five incoming paths to every outgoing path in the nervous system. This means that several paths carry impulses in from the receptors to the cord where only one path is available for carrying the impulse out from the cord to the effector. To state it differently—there are many more points where afferent impulses can be aroused than there are separate motor outlets. Each motor neuron, therefore, is the possible outlet for impulses aroused at many different sensory points on the bodily surfaces. The single efferent path is known as the final common path.

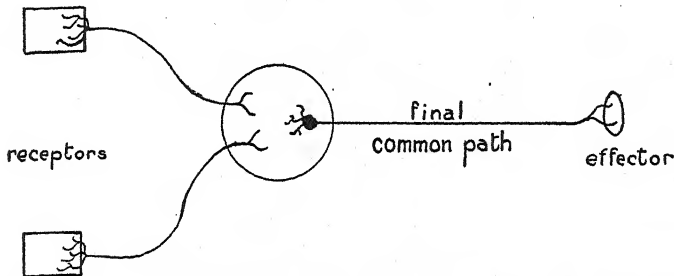
The final common path is a very important instrument of organization. The cord distributes the impulses selectively and they converge on the final common path, where the prepotent impulse monopolizes the path to the exclusion of less urgent impulses. The common path, adapted to serve but one purpose at a time, thus effects singleness of action.

2. Reciprocal Innervation.¹ Reciprocal innervation is the principle underlying the crossed-extension reflex which is involved in the coördination of the right and left legs for walking. If the right foot of a spinal cat is stimulated vigorously, the right leg is flexed and the left leg simultaneously extended. Thus the endangered foot is removed from the source of injury, and the unharmed leg is engaged for support. Excitation and inhibition work reciprocally. In the right leg the flexion reflex is excited while the extension reflex is inhibited; in the left leg, just the reverse (reciprocal) reflexes occur—the extension reflex is excited

¹"Reciprocal Innervation is the principle that the two motor centers which innervate a pair of mutually antagonistic muscles—e.g., biceps and triceps of the arm—are interrelated in such a way that as one of them comes into action and contracts its muscle, the other center commonly . . . inhibits . . . the antagonistic muscle. This interrelation of the paired centers is important for the production of alternating flexion and extension of a joint; e.g., of the hip and knee joints in walking." H. C. Warren: *Dictionary of Psychology*. 1934. By permission of Houghton Mifflin Co.

while the flexion reflex is inhibited. Wherever you have excitation, there is a reciprocal inhibition.

3. Synaptic Conduction. Any act, no matter how simple, involves more than one neuron. The impulse, therefore, crosses one or more synapses. The synapse is a significant factor in the organization of nervous functions. The synapse, for one thing, is the basis for the law of forward conduction. The direction of the impulse is irreversible, since the synapse acts as a valve. It is obvious that irreversible conduction promotes orderly activity. The synapse is responsible in other ways for coördination but we shall elaborate no further in this discussion.



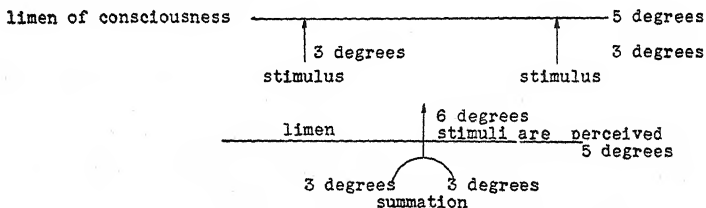
A schematic diagram to illustrate how several sensory impulses converging on a single motor path may be combined or "funneled" to produce an allied reflex.

4. Facilitation. When two acts are allied, one of them may facilitate the other, that is, cause it to be increased or exaggerated. This phenomenon may be illustrated with the patellar reflex (knee jerk). Let the subject be seated, strike the tendon just below the knee with a sharp blow while the leg is hanging limply with the knee bent, and the leg will be seen to swing upward slightly. If a dynamometer (an instrument for measuring the gripping strength of the hand) be squeezed at the moment the tendon is struck, the extent of the jerk is augmented.

Certain reflexes may combine harmoniously, being

mutually reënforcing reactions. Take the scratch reflex in the dog, as demonstrated by Sherrington. "If while the scratch reflex is being elicited from a skin point at the shoulder, a second point distant, e.g., ten centimeters from the other point but also in the receptive field of the skin, be stimulated, the stimulation at this second point favors the reaction from the first point."¹ The greater the similarity in the type of action which each stimulus separately applied would evoke, the greater the reënforcement when both stimuli are applied simultaneously.

5. Summation. A number of stimuli, each of which is inadequate by itself, may be added together to reach a degree of intensity sufficient to rise above the limen of stimulation. The limen means the threshold, and any stimulus must be of a certain intensity (within the subliminal and supraliminal limits) to be felt, that is, to arouse a sensation. Let us picture this mathematically:



Suppose a sound must be as loud as 5 (an arbitrary amount of loudness) to be heard. Then a sound of 3 units of loudness is not loud enough to be heard. Now if two sounds of 3 units each occur, they will combine (add together) to make 6 units which is loud enough to be heard. A girl is left at home to take care of a baby and she falls asleep. The parents ring the doorbell upon their return, but there is no effect upon the slumbering caretaker. Then the baby cries—still with no effect. Finally the

¹C. S. Sherrington: *The Integrative Action of the Nervous System*, p. 120. 1906. By permission of the Yale University Press.

doorbell rings, the baby cries, and the telephone rings, all simultaneously, and the guardian is aroused. In other words, the three sounds ally themselves to break over the threshold. Each stimulus in itself is inadequate, but all three summated reach the intensity adequate to arouse consciousness.

Now let us return to the scratch reflex in the dog. He is being scratched at two points on the same shoulder, but at each point the stimulus is of subliminal (below the threshold) intensity. What happens? "The two stimuli, though each unable separately to invoke the reflex, yet do so when applied both at the same time."¹ Thus an allied reflex is produced by the summation of inadequate stimuli. The response is facilitated by summation.

With respect to the temporal factor, summation may be simultaneous or successive. Simultaneous summation is illustrated by the girl who awakened to the combination of doorbell, telephone, and crying baby; successive summation, by the salesman who bombards the prospective customer with selling-arguments until sales resistance is overcome, by the police court judge who makes an example of the last of several persons who come before him on the same day for the same misdemeanor, or by the child who obtains a bicycle through persistent teasing.

6. Inhibition. The process of checking an activity is called inhibition. To inhibit a movement is to stop it. It is fairly easy to see how a muscle may be excited to action, but how are you going to "excite" it so that it will stop contracting? Inhibition is no less significant than excitation as a means of securing harmonious activity. As you know from experience, you cannot extend your arm and flex it at the same time. If two stimuli occur simultaneously, one calling for flexion of the right arm and the other for extension of the right arm, either flexion

¹Sherrington, *loc. cit.*

alone will take place, or extension alone, or neither—never both, for both would be impossible. Coördinated activity, in such a case, depends upon the reciprocal functioning of excitation and inhibition. When flexion of the arm takes place, there must be reciprocal inhibition of the extensor muscles—that is, when a particular movement such as flexion occurs, there must be a synchronous inhibition of the antagonistic movement, extension. In actual life, a host of stimuli act concurrently, but the organism reacts now to one, now to another, depending upon which group of stimuli becomes prepotent (gets the right of way).

Let us see how antagonism can be demonstrated experimentally—by applying stimuli which evoke reflexes which inevitably interfere with each other. Suppose you stimulate a dog on the right shoulder so that he flexes his right foot (scratch reflex). Now while this reflex is in progress, stimulate the left shoulder. If he flexes his left foot for purposes of scratching, he finds that he has no leg left to stand on. So he stops scratching with the right foot, and stands on it instead. Where two reflex activities are incompatible, one of them must be suspended in favor of the other. What is it that determines which stimulus will succeed in evoking its reflex to the exclusion of the other? In other words, what kind of stimuli are prepotent?

A reflex may dispossess the rival reflex when that rival is fatigued. Thus serial variety of reaction is insured. Stimuli exciting pain are apt to be prepotent. It is clear that this fact is related to the function of self-preservation, for an animal must give special heed to dangerous stimuli. As an example, a hornet will usually have the right of way. Intense stimuli enjoy precedence; therefore, a strong stimulus will inhibit a reflex in progress.

Inhibition, then, is involved in the evocation of a contrary response. An individual may be starting toward the front door when he discovers the sheriff is waiting for him

outside. The withdrawal response may then serve to inhibit further approach to the door.¹

Experiments by Pavlov have demonstrated that a non-response is not a passive process but the result of a positive inhibition. If the salivary response is conditioned to a metronome beat and then extinguished by repeating the stimulus of the beat without accompanying it with the offer of food, the beat will produce no response. Then, if a tuning fork is sounded while the metronome is beating, the response of salivation does occur, because, it is explained, the fork acts as a distraction to sidetrack the activity of inhibition responsible for non-response.

F. The Nature of the Nerve Impulse. The excitation of a nerve initiates definite electrical disturbances which can be detected by a galvanometer. The disturbance involves chemical changes during which oxygen is consumed and carbon dioxide is liberated. The exact nature of the impulse itself is still a matter of theory.²

G. Specific Energies. Each sensory nerve has its peculiar or specific energy—each sensory nerve gives rise to its own quality of sensation and to no other, regardless of the nature of the stimulus. No matter how it is stimulated the auditory nerve never gives the sensation of touch—but always the sensation of hearing.

Consider vision. Stimulation of the optic nerve invariably produces visual sensations. Light rays affect the optic nerve through the retina to evoke the experience of light. A blow on the eyeball causes you to “see stars.” If the optic nerve is stimulated electrically or is mechanically injured, a flash of light is perceived.

Consider sound. Drugs affecting the auditory nerve

¹E. B. Skaggs: *The Major Forms of Inhibition in Man*. 1931.

²For a more detailed account of the nature of the nerve impulse, see L. T. Troland: *The Mystery of Mind*, Chap. 12. 1926.

See also Alexander Forbes: “The Mechanism of Reaction,” in *Handbook of General Experimental Psychology*, C. Murchison, Editor. 1934.

produce ringing sensations—much like the experience you get after you have been swimming and acquired an ear full of water.

Consider touch. Tactual fibers inevitably produce sensations of touch whether the stimulus be mechanical, thermal, electrical, or chemical.

Where does the specificity lie? What is peculiar about the optic nerve which restricts it to visual experience? There are three possibilities:

The Nerve Itself. Johannes Müller, the discoverer of the law, believed that each sensory fiber was constructed peculiarly. Research, however, has revealed no histological or physiological difference between an optic nerve and an auditory nerve, for example.

The Sense Organ. Visual sensations are due to the peculiar receptor, the eye; auditory sensations to the ear, etc. This possibility is eliminated by the fact that direct stimulation of the nerve gives the peculiar sensation—the impulse, in this case, not entering the sense organ.

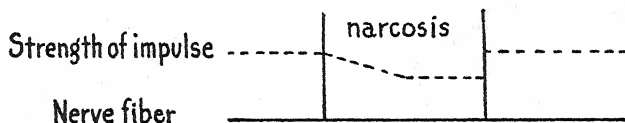
The Sensorium. The third possibility is the sensorium—the area in the cerebral cortex in which the nerve finally ends—the optic nerve ending in the occipital lobe, the auditory nerve in the temporal lobe, etc. The specificity of any sensation, therefore, is determined by the particular part of the brain where the particular nerve fiber reaches its destination.

H. The All-or-None Law. If a nerve fiber is stimulated, it is stimulated maximally in each and all of its parts—and the maximum is determined by the condition of the fiber at the time.

The analogy for the All-or-None Law is a train of gunpowder. Suppose you wet a section of the fuse. As the flame passes over the wet part, its speed is retarded, but if the flame gets past the wet section at all the explosion is just as intense as it would have been had the entire fuse

been dry. A weak stimulus, if it is just barely adequate, produces just as much of an effect on a nerve fiber as a much stronger stimulus—that is, the effect is all or none.

If a section of a nerve fiber is narcotized, it is found that the strength of the impulse is decreased through the region of narcosis—but if the impulse gets through at all it is just as strong as it was originally. Note that the maximum is variable. The maximum changes with the condition of the fiber. Consequently, the maximum under narcosis differs from the maximum of the normal nerve fiber. The “all,” therefore, is not always of the same strength.



Testing the All-or-None Law by passing the nerve through a narcotized chamber.

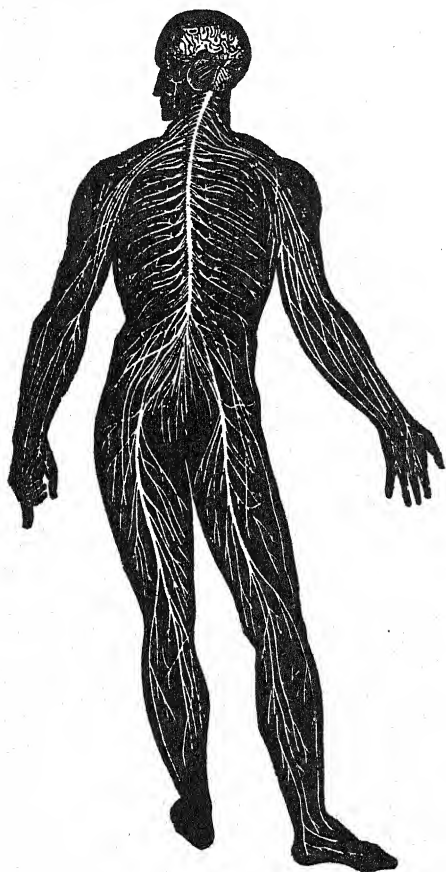
If the All-or-None Law is true, why is it that a strong stimulus feels different from a weak one? Stimulation is graded by the number of fibers involved. A strong stimulus excites more fibers than a weak one, though each fiber is excited maximally. Variations in intensity are thus accounted for.

The All-or-None Law, therefore, involves two facts: (1) The nerve fiber is stimulated maximally if it is stimulated at all. (2) The maximum is variable according to the condition of the nerve.

III. ORGANIZATION OF THE NERVOUS SYSTEM

The nervous system is divided into (A) the central nervous system, (B) the peripheral nervous system, and (C) the autonomic nervous system. *The central nervous system* (cerebro-spinal) consists of the brain and the spinal

cord. The brain is encased in the skull, where it is protected from injurious stimuli in the outside world. The



THE HUMAN NERVOUS SYSTEM

Diagram illustrating the general arrangement of the nervous system.

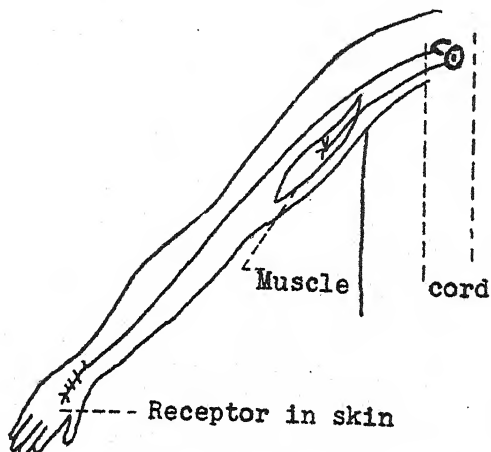
(From H. N. Martin: *The Human Body*, p. 120. 1912. By permission of Henry Holt and Company.)

cord is an extension of the brain passing down through a tube in the backbone. Nerves ramify to all parts of the body from the central system which secures the integration necessary to unified behavior. There are three types of fibers in this system:

1. Projection fibers—which conduct impulses to and from the cord and cortex.
2. Commissural fibers—which connect the right and left cerebral hemispheres.
3. Association fibers—which connect areas on the same hemisphere.

With a possible exception or two, the only nerve connection between any two parts of the body, no matter how closely these parts are located to each other, is through the cerebro-spinal system. If the hand is pricked and then withdrawn from the

stimulus, the path of nervous conduction may be represented thus:



NERVE CONNECTION IN HAND WITHDRAWAL

The connection from the back of the hand, which is receiving the stimulus, and the arm muscle which makes the response. The nerve center is indicated by the dotted lines.

(Schematic diagram adapted from R. S. Woodworth's *Psychology*, p. 510. By permission of Henry Holt and Company.)

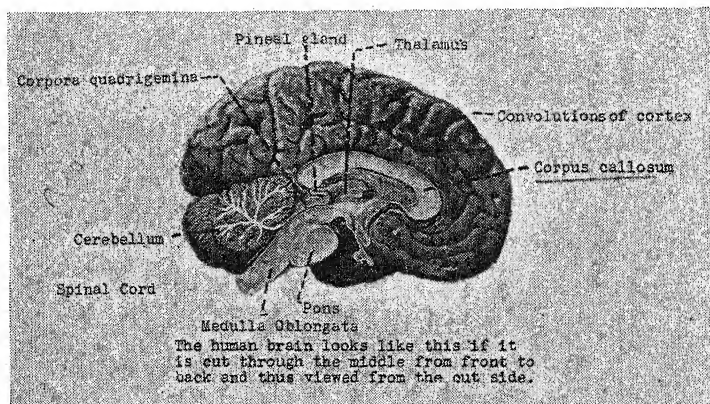
The sensory nerves and the motor nerves outside the cerebro-spinal system make up the *peripheral nervous system*.

The nerves of the *autonomic system*, a chain of ganglia outside the cord, exclusively motor in function, are distributed to the organs of digestion and circulation.

A. The Central Nervous System. The nervous system is a hierarchy, with the cerebral cortex in supreme control. The governing mechanisms between the cortex and the cord are principally the thalamus, the cerebellum, and the medulla oblongata. We shall review in outline the functions of the main levels of the hierarchy.

1. The Cerebral Cortex. At the top of the central nervous system is the cerebral cortex which, from the psychological standpoint, is the most important part of the brain. It is the cortex which is most intimately related to consciousness, and which takes care of the higher mental processes such as perception, imagination, and reasoning.

In order that as much surface as possible may be packed into a small container, the brain is folded over and over into convolutions. The surface area is thus increased



LONGITUDINAL SECTION OF THE HUMAN BRAIN

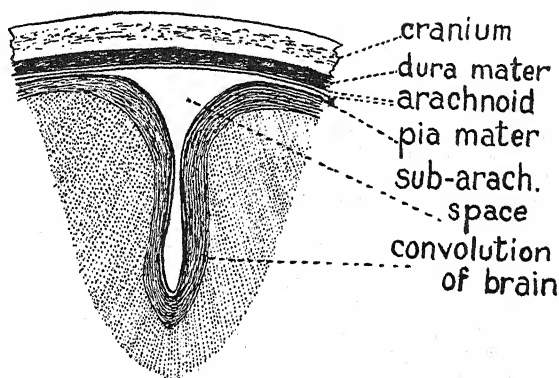
(After J. B. Watson)

without a corresponding increase in the bulk of the hemispheres. It is the surface area of the cortical tissue rather than the size of the skull which constitutes the physical basis of intelligence.

The brain is well protected by three layers—the pia mater, the arachnoid layer, and the dura mater. These three layers serve as a sort of wrapping within the bony packing case.

Longitudinally viewed (from directly above), the brain is symmetrically divided into two hemispheres, separated

by a deep cleft known as the longitudinal fissure. The two hemispheres are joined by a large band of transverse fibers known as the corpus callosum. See the illustration on page 150. As you look at the page, the fibers run in the plane to and from the eyes. The fibers of the corpus



THE THREE MEMBRANES OF THE BRAIN (SCHEMATIC)

(After Poirier and Charpy)

The cerebrospinal fluid is contained in the subarachnoid space.

callosum are called commissural fibers. Their function, as has been stated, is to link the right and left hemispheres.

a. Cephalization. As we proceed upward in the animal scale, we discover that one end of the organism becomes the most important portion of the body. Wormlike forms have a definite habit of moving head first, the head and tail ends are functionally separate, and the leading segments are highly dominant over the rest of the body. It was natural that the chief sense organs should develop at the front end—which is the first to come into contact with objects—and that the brain should develop at that extremity too. The progressive elaboration of the head, with its assumption of supreme control, is known as cephalization. Presumably, the assumption of upright

posture by man has brought the front end to the top, where the bodily leadership is still centralized.¹ Cephalization has made possible the marvelously coördinated activity of the higher organisms. If you cut a worm in two, you have two worms; if you cut a human being in two,



A PHRENOLOGY CHART

you have nothing. That is the price we pay for the advantages of cephalization.²

b. Localization of Functions. The cerebral cortex is such a very complicated system that it deserves special attention, for in its intricate organization is to be found the physiological explanation for the mental activities which constitute the superiority of man. Specialization of functions in the cerebral cortex is an indisputable fact. Different areas have different functions.

¹See Frederick Tilney: *Master of Destiny: A Biography of the Brain*. 1930.

²See C. J. Herrick: *Neurological Foundations of Animal Behavior*, p. 96. 1924.

The serious study of the cerebrum goes back to the early nineteenth century when Gall introduced the pseudoscience of phrenology. Gall believed that there are certain bumps on the skull which are indices of special abilities. Thus one bump would indicate mathematical ability and another wit. Phrenology took hold of the popular mind and it became the rage for people to go about feeling each other's heads.

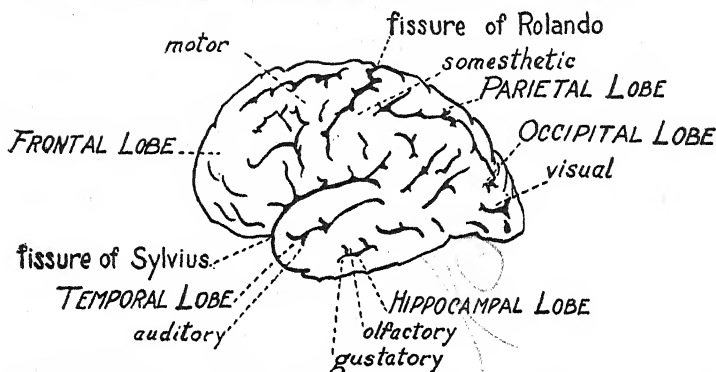
External configurations of the skull do not furnish a sound basis at all for estimating the sizes of different areas of the brain. There are neither psychological nor neurological grounds for departmentalizing the mind into distinct faculties, each operating in a special area of the brain, yet phrenology is still practiced by quacks who pose as scientists.

Valuable data accumulated by Gall eventually inspired investigation which led to the discovery of a localization, not of faculties, but of functions. During the Franco-Prussian War, an army surgeon named Fritsch made a remarkable observation. While operating on a wounded soldier, he applied the galvanic (electric) current to the exposed surface of the brain—and noted that certain muscles of the body twitched. By means of various methods which we shall examine soon, the areas of the cortex have been mapped.

The somesthetic area of the cortex is in the region behind the fissure of Rolando; the motor area of the cortex is in the region in front of the fissure of Rolando. Each localization on the sensory side has a corresponding localization on the motor side of the fissure. Suppose we stimulate the region to which impulses from the lips are conducted. When a stimulus is applied to the sensory area, the impulse is transmitted to the motor area and thence to the part concerned—and the lips move. This was the phenomenon which Fritsch discovered. If a cat's

brain is exposed, stimulation of one sensory region will cause the legs to move, another the head, etc.

In addition to the sensory and motor areas are the association areas which link together the various cerebral areas. The association areas are undeveloped at birth. It is upon these areas, therefore, that experience has the most effect. The difference between an intelligent person and a stupid person would be largely a matter of the development of the association regions of the cortex. The



LEFT SURFACE OF BRAIN, SHOWING THE PRINCIPAL LOBES,
WITH THE SENSORY AND MOTOR AREAS

The sensory areas are: *occipital lobe* (sight); *temporal lobe* (hearing); *parietal lobe* (touch and kinesthesia—the somesthetic senses); *hippocampal lobe* (smell and taste).

infinitely complex human mind is based on the vast system of nervous connections in the association areas. The conditioned reflex is not so simple an affair when these cortical areas are taken into account, as they must be, to explain the associative basis of the conditioning process.

(1) *Methods of Studying Localization.* Cerebral functions may be localized in the following ways:

Stimulation is the method used by Fritsch. Stimulate a particular region and observe the particular corresponding response.

Extirpation. Cut out a well-defined area and see what function is lost. The difficulty with this method is that surrounding areas are apt to be affected by the operation.

Myelinization. Flechsig noticed that the nerve fibers of the developing brain differ in their rate of maturation; some fibers are enveloped with the myelin sheath before others. Projection fibers mature early, chiefly before birth; association fibers mature after birth. Since the fibers take on the myelin sheath at different times, one can trace their courses to the cortical areas.

Pathology. Accidents to the brain leave specific defects as may be seen in the following cases:

Alfonso Debra, 10-year-old Chicago boy, lost five ounces of his brain in an accident. He suffered a cut in his head when struck by an automobile and lost part of his brain from the occipital region. Examination revealed that he was above the average mentally in spite of the injury. The youth's only difficulty was his inability to see when he looked to the right because of an injury to the left occipital lobe of the brain.¹

Harry Cowan murdered his sweetheart, Miss Edith Burton, in an alleged suicide pact in 1925. Cowan is totally blind, partially deaf, and has lost the sense of taste as the result of the bullet he fired into his own head after Miss Burton was fatally wounded.²

In 1848, Phineas P. Gage, a foreman in a quarry, was engaged in tamping a blast when the charge exploded prematurely, driving a crowbar through the left side of his jaw and out through the top of his head in the frontal region. He lived for twelve and a half years after the accident. He was able to perform practically all his somatic functions, such as voluntary muscular movements, hearing, and seeing. His judgment and reasoning power, however, were seriously impaired. His disposition

¹The Boston *Herald*, January 3, 1927.

²The Boston *Post*, March 18, 1927.

suffered considerably as he became prone to unprovoked fits of rage. He grew dishonest and irregular in his work habits. For most of his faults he may, I think, be forgiven!

The pathological approach to the study of the localization of cerebral functions can well be illustrated by an examination of aphasia. *Aphasia* is the total or partial loss of the use or understanding of language, the vocal organs and the sense organs remaining intact. Any of the qualities or varieties of speech may be affected, both spoken and written. Since speech is so intimate a part of many mental operations, the aphasia may involve widespread consequences.

In motor aphasia, of the partial sort, the individual can utter articulate words correctly, but he cannot combine them into grammatical sentences. Words are thrown together in random fashion so that a "word-salad" results. Motor aphasia is due to an injury in the frontal lobe.

Sensory aphasia may take the form of word-deafness in which the person hears what is said but derives no meaning from the utterance, or it may take the form of word-blindness in which the individual can see the printed words (written speech) but cannot make any sense out of them. In word-deafness the association areas about the temporal lobe are injured; in word-blindness, the association areas about the occipital lobe. The experience of listening to or reading an unfamiliar foreign language is comparable, since the lack of comprehension is due to a paucity of connections in the associative areas requisite to an adequate understanding of that language.

It is important to point out that the lesion which produces aphasia affects the association centers rather than the projection centers, since there is no primary sensory deficiency—the word-blind person, for example, is not blind. The words are seen but not understood because the associative connections with the occipital lobe are

impaired. With the correlations lacking, experience remains a jumble.

(2) *The Present View of Localization.* Through these four methods, data have been gathered which indicate that:

There is a specific localization of function in the cerebral cortex, in the sense that particular systems of sensory projection fibers terminate in special regions (the sensory projection centers), that from other special regions (the motor projection centers) particular systems of efferent fibers arise for connection with the lower motor centers related to groups of muscles concerned with the bodily movements, and that between these projection centers there are association centers, each of which has fibrous connections of a more or less definite pattern with all other parts of the cortex. . . . All conscious processes probably require the discharge of nervous energy throughout extensive regions of the cortex.¹

Recent experiments by Lashley on the maze-learning abilities of rats whose cerebral cortices have been subjected to various degrees of extirpation offer evidence pointing toward less emphasis on the specific localization of cerebral functions. Rats may learn a maze after extensive cerebral lesions, though the learning process takes longer. Retardation is proportional to the amount of cerebral tissue injured, or to put it conversely, the rate of learning depends upon the amount of cerebral tissue which remains intact and capable of functioning. Reëducation after cerebral lesion offered no certain evidence that the reacquired functions are carried out vicariously by any specific loci. It seems probable that the reacquired functions were to be attributed to a reorganization of the entire neural mass rather than to an action of specific areas. For the learning of the mazes, no part of the cortex is more important than any other.

Lashley
"note"

¹C. J. Herrick: *Introduction to Neurology*, pp. 334-335. Third edition, 1922. By permission of the W. P. Saunders Company.

"In spite of the greater specialization of cerebral areas in the higher forms, the problems of cerebral function are not greatly different from those raised by experiments with the rat," says Lashley. Consequently he feels justified in drawing the following conclusions applicable to human beings:

In one phase or another the results with every habit indicate the importance of the total mass of tissue, and a certain lack of specificity in cerebral function. . . . The most surprising outcome of the work has been the number of lines of evidence pointing to the equivalence of function of all parts of the cerebral cortex for learning. . . .

The more complicated and difficult the activity, the less the evidence for its limitation to any single part of the nervous system. . . .

The mechanisms of integration are to be sought in the dynamic relations among the parts of the nervous system rather than in details of structural differentiation.²

The evidence indicates that the learning and retention of sensory and motor habits cannot be explained in terms of fixed nervous pathways, specific synaptic connections, or localized brain structures. The brain functions as a whole in learning.³

Lashley's conclusions must be considerably modified in the light of more recent experimental evidence which shows that the adult human brain is far more localized than the rat brain. Findings with regard to the rat brain cannot be applied to the adult human brain without serious error. The clinician and especially the surgeon, according to Tilney, have learned to have the highest respect for the

¹K. S. Lashley: *Brain Mechanisms and Intelligence*, p. 176. 1929.

²*Ibid.*, pp. 122, 156, 176. By permission of The University of Chicago Press.

³See H. E. Garrett: *Great Experiments in Psychology*, Chap. 14, "Franz's and Lashley's Experimental Studies of the Role of the Brain in Learning." 1930.

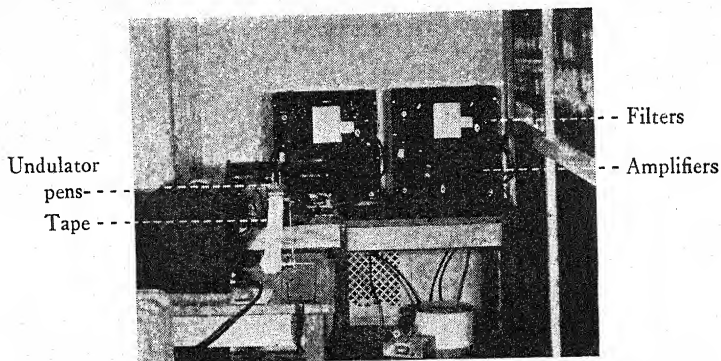
For a critical review of the experimental work of Franz and Lashley, see C. J. Herrick: *Brains of Rats and Men*. 1926.

exact localization of function in the human cortex.¹ Tilney's assertion is confirmed by the research conducted by Penfield, who stimulated the cerebral cortex of conscious patients operated on under local anesthesia. Exploring the brain with an electrode, he applied the stimulus and requested the subject to report his experiences. When the electrode was applied to one particular region, the subject stated that he experienced a "feeling of electricity" in his left index finger; another region, and he projected his sensation to the left lower lip; another region, swallowing occurred; another region, closure of the left hand; still another region, vocalization, in the course of which the patient emitted the cry of "Oh!" The simple movements made in response to the cortical stimulation appeared to the patient to be involuntary. He would report, "The hand moves itself." Penfield found that the areas of the cortex differ slightly from case to case, that is, they are not circumscribed like the keys on a piano. His investigations showed also that there may be some substitution of functions in the adult cortex, though it appears to be more extensive in the infant cortex. There is, apparently, an increased functional specialization of the cerebral cortex in man, especially in the adult.²

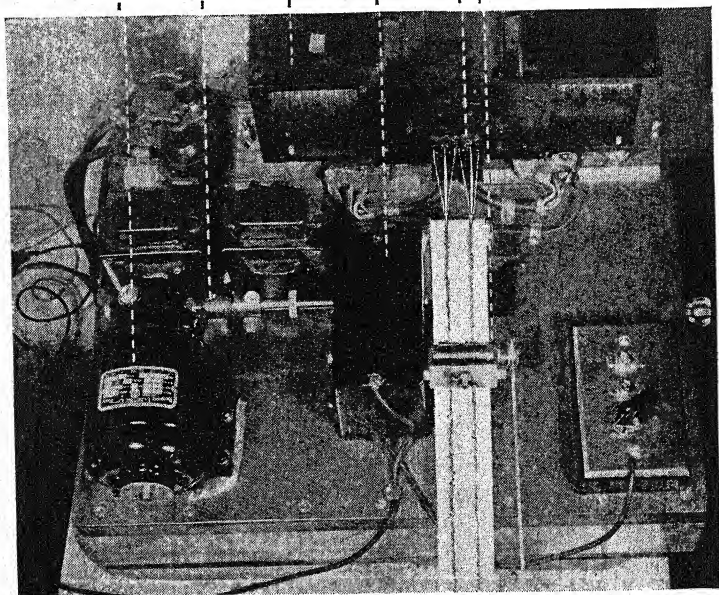
c. *Brain waves.* The study of brain waves has shed considerable light on the nature of nervous activity. Dr. Hans Berger, of Jena, found that the changes in electrical potential connected with human brain activity may be magnified by running them through a vacuum-tube amplifying system similar to that used in radios. The enhanced current is used to operate an oscillograph, which writes, in light on a photograph, a wavy line corresponding to the fluctuations of the electricity in the brain. Im-

¹Frederick Tilney: "The Brain from Fish to Man," *Scientific Monthly*, November, 1937.

²Wilder Penfield: "The Cerebral Cortex and Consciousness," *The Harvey Lectures*, Series XXXII, 1937.

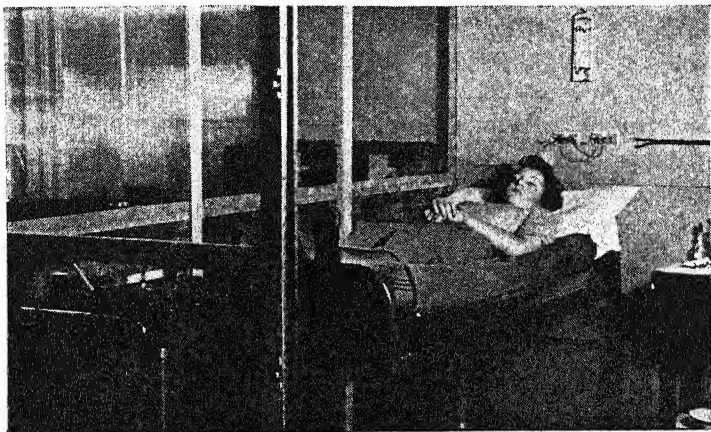


		Coils for amplification of pen movements	
		Gears governing speed of tape	
Adjustable gear shift		Undulator pens	
Motor		Tape propelled by friction cylinder	



(1) The recording pens writing brain-wave records from two parts of the scalp surface. Apparatus from in front. The Faraday electrical shield is on the right. (2) Photo taken from above. Apparatus used at the Worcester State Hospital by Doctors Hoagland and Rubin of Clark University.

proved recording is now taken care of by ink-writing undulators which write on a moving paper tape. The oscillograph has been discarded in favor of the undulator-tape technique, because the tape costs less than film and because the experimenter can make his notations on the tape as it goes by. The electrodes applied to the different



(3) Normal subject on bed in adjacent room. Eyes closed to bring out alpha wave on record. Experimental situation used at the Worcester State Hospital by Doctors Hoagland and Rubin of Clark University.

areas of the scalp consist of wires attached to lead pellets 2 to 3 mm. in diameter, the pellets making contact with the scalp through electrode paste and being held in position by collodion. The delicacy and accuracy of measurement have been so increased by means of amplification that potentials of a millionth of a volt can now be studied. Physiologists anticipate such revolutionary advances in physiology from the application of electrical magnification as occurred in anatomy with increased optical magnification. The record is referred to as an electroencephalogram, and the recording apparatus is called an electroencephalograph.

Investigations based on the electroencephalograph, with

evidence gathered from other sources, indicate that the activities of the cortex may be autogenous. Even when there is no stimulation being applied, there is a continuous electrical activity exhibited in all parts of the brain. These spontaneous discharges result from the metabolism of the cells. A definite relationship has been established between the brain waves and the rate of oxygen consumption.¹ The central nervous system was formerly looked upon as a great silent network of neurons activated only in response to sensory stimulation, a quiescent organ awaiting excitation. Similarly, a nerve was supposed to offer an inert track into one end of which an impulse entered, and from the other end of which it emerged after being pushed along by something behind it. The present evidence demonstrates that the nerve itself generates, or actively propagates, the impulse, as a fuse passes on a spark. The nerve is active, not passive. In the same way, the central nervous system must now be looked upon as composed of active neurons continually in play, which are modified rather than set in motion by particular types of stimuli.²

The old picture of a nervous system with a set structural pattern waiting peacefully for nerve impulses to travel through it, like a switch-yard set for a freight train, gave rise to the view that there were static anatomical patterns of activity in the nervous system, and that the behavior resulting from any particular stimulus was determined primarily by the nerve cell connections, and by the paths anatomically open to the impulse flowing along. The picture was a spatial one. This view is now supplemented by the hypothesis that patterns are in time as well as space, that they are dynamic and not static, and that they are

¹H. Hoagland, M. A. Rubin, and D. E. Cameron: "The Electroencephalogram of Schizophrenics during Insulin Hypoglycemia and Recovery," *American Journal of Physiology*, 1937, 120, 559-570.

²R. W. Gerard: "Brain Waves," *Scientific Monthly*, 1937, 44, 48-56.

determined not only by the anatomical connections, but also by the physiological state of the nerve cells.

The electroencephalogram shows the amplitude and form of the electrical-impulse waves accompanying mental activity. The larger waves are called alpha waves and the smaller ones beta waves. When the mind is at rest there is a steady rhythmic wave motion, a characteristic pattern for each individual. In fact, identical twins show similar patterns suggesting that certain features of the electroencephalogram, notably the alpha rhythm, reveal inborn characteristics of cortical organization.¹ There are no recognizable rhythms in infants below three months of age. The frequency of the waves, about four or five per second in the period between three and nine months, slowly increases with age up to the adult alpha frequency of ten per second, which is attained at about ten years of age. The wave patterns vary under different conditions of mental activity. The pattern during sleep differs from that during the ordinary waking state; the pattern is altered by intense concentration on a problem; the pattern is also affected if the senses are subjected to visual or auditory stimuli. Brain waves are being used in the location of cerebral tumors. The patterns for epilepsy and schizophrenia are being found valuable in the diagnosis and prognosis of these disorders.² Its future use in psychiatry appears to be very promising.

alpha wave
12 m

2. The Thalamus. The thalamus, located in about the center of the brain, is the vestibule through which all sensory impulses, except smell, must pass on the way to

¹H. Davis: "Some Aspects of the Electrical Activity of the Cerebral Cortex," *Cold Spring Harbor Symposia on Quantitative Biology*, Vol. 4, 1936.

²Regarding epilepsy, see F. A. Gibbs, H. Davis, and W. G. Lennox: "The Electroencephalogram in Epilepsy and in Conditions of Impaired Consciousness," *Archives of Neurology and Psychiatry*, 1935, 34, 1133-1148.

Concerning schizophrenia, see H. Hoagland, M. A. Rubin, and D. E. Cameron: "Electrical Brain Waves in Schizophrenics during Insulin Treatments," *Journal of Psychology*, 1936, 3, 513-519.

the cortex. The thalamus, or more specifically, the hypothalamus, is the neural center for the *expression of emotion*.¹ While the neural processes underlying emotional consciousness are probably cortical, the center for the organized explicit patterns of emotional behavior lies in the more primitive parts of the brain.² Head, Sherrington, Bard, and others have demonstrated that decorticate animals express rage in a manner very similar to that of normal animals. The sham rage of the decerebrate animal is elicited by trifling disturbances of any kind, is astonishingly intense, and possesses a width and energy of expression that make it unmistakably the counterpart of intense fury in the normal animal. The rage reactions include: "lashing of the tail; arching of the trunk; thrusting and jerking of the limbs in the thongs which fastened them to the animal board, together with protrusion of the claws and clawing movements; snarling; movements of the head from side to side with attempts to bite; very rapid panting with mouth open and movements of the tongue to and fro."³ Bard points out that the behavior attending the major emotions, fear and rage, is evoked by the urgency of certain definite circumstances, and that it is plainly directed toward the preservation of the individual. It constitutes a reaction that is primitive, energetically purposive, and common to the divergent members of the vertebrate series. Bard removed the cerebrum of an animal and found emotional behavior of an integrated sort still persisted, indicating that the organizing center for

¹Philip Bard: "On Emotional Expression after Decortication with Some Remarks on Certain Theoretical Views," Part I, *Psychological Review*, 1934, 41, 309 ff.

²Philip Bard: "Emotion: I. The Neuro-Humoral Basis of Emotional Reactions," in *A Handbook of General Experimental Psychology*, p. 285, C. Murchison, Editor. 1934.

For a more recent theory regarding the function of the hypothalamus in emotional activity, see J. W. Papez: "A Proposed Mechanism of Emotion," *Archives of Neurology and Psychiatry*, 1937, 38, 725-743.

³Bard, *A Handbook of General Experimental Psychology*, p. 287.

such reactions is below the cortical level. From the evolutionary point of view it is significant that such important adaptive reactions should be under the control of a subcortical center.¹ We shall note that this is in keeping with the general principle that the more fundamental activities essential to the continuance of life are delegated to the lower levels of the nervous system.

3. The Cerebellum. The cerebellum is situated at the base of the brain, to the rear. The cerebellum, the functions of which are imperfectly known, probably coördinates the postural components of voluntary movements initiated by the cerebral motor cortex. The two lobes of the cerebellum are connected by a transverse band of fibers called the pons.

4. The Medulla Oblongata. The medulla oblongata is located forward and just above the juncture of the brain stem and the spinal cord. The medulla oblongata contains the nerve centers which control circulation and respiration. Again it is pertinent to remark that in view of our ignorance of the principles of breathing and blood circulation, it is to our advantage that these processes are not ordinarily² under our conscious regulation, but rather are taken care of by a lower nervous center.

5. The Spinal Cord. The spinal cord, structurally speaking, is an extension of the brain. The spinal cord is the coördinating agency of the lowest level, organizing some of the reflexes which constitute the basic units of all behavior.

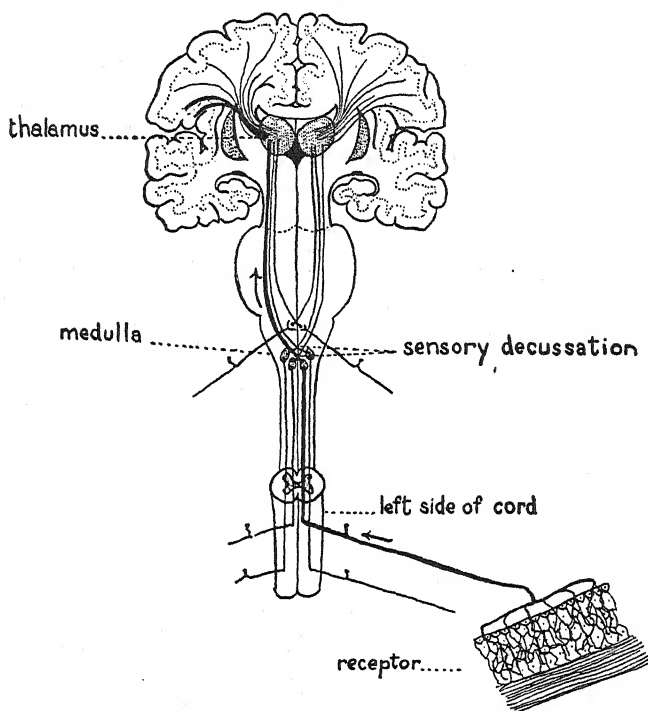
The cord serves to gather in the sensory impulses destined for the higher levels, and to distribute the motor

¹See Philip Bard: "A Diencephalic Mechanism for the Expression of Rage with Special Reference to the Sympathetic Nervous System," *American Journal of Physiology*, 1928, 84, 490-515.

See also W. B. Cannon: "Again the James-Lange and the Thalmic Theories of Emotion," *Psychological Review*, 1931, 38, 281-295.

²I say "ordinarily" because when we are sick with a head cold, breathing often becomes a conscious process, much to our discomfort and fatigue.

impulses descending from the higher centers to the muscles and glands. We shall trace, first, the path of a typical



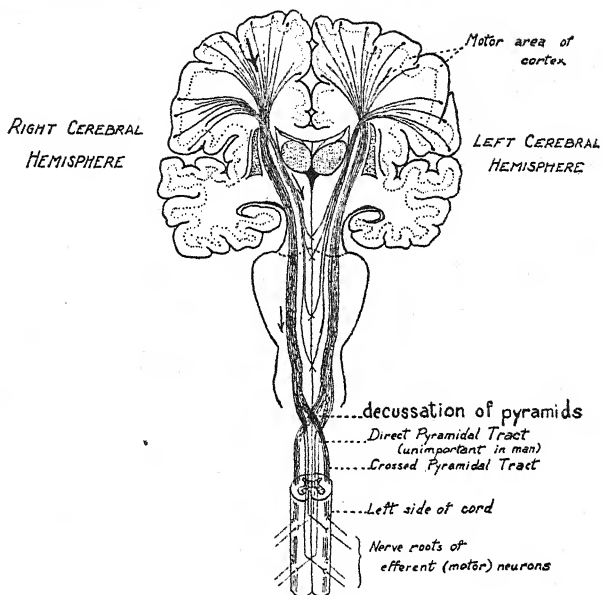
THE SENSORY TRACT
(After Poirier)

sensory impulse, and second, the path of a typical outlet over the motor tracts.

We shall take first the path of conduction for a sensory impulse.

The diagram represents the typical path of an impulse from the skin (receptor) on the left side of the body to the opposite side of the cord, up through the medulla and thalamus to the cerebral cortex (right hemisphere). No portion of the cortex is directly connected with sense

organs. All sensory impulses, except smell, pass through the thalamus on the way to the cortex.



THE MOTOR TRACT
(After Poirier)

The motor impulse is transmitted over the pyramidal tracts.

Note that the impulse leaves the right hemisphere (cortex) and comes down the left-hand side of the cord, thus bringing the impulse back to the region of stimulation. It is natural that the response be made in the region of stimulation.

The motor tracts are made up of pyramidal neurons—neurons which are comparatively long. Therefore, there are fewer synapses to be crossed, and the time required for reaction is reduced to a minimum.

In a right-handed person, the left cerebral hemisphere is

dominant—that is, the left hemisphere is functionally more important. On account of the decussation (crossing), the left hemisphere takes care of the right-hand side of the body, while the right hemisphere governs the left-hand side of the body.

The graduated importance of the levels of the nervous hierarchy may be appreciated by a study of the effects of alcohol on the human system. Alcohol is a narcotic, not a stimulant. It impedes nervous conduction.

Alcohol begins at the top of the nervous hierarchy and works downward. Thinking cannot proceed at its maximum efficiency because the nervous connections in the cerebrum have been narcotized. A drunkard's wit can only be appreciated by another drunkard, whose cortex has likewise been drugged, and whose critical faculties have been paralyzed. Alcohol seems to be a stimulant because it removes the inhibiting effects of the cortex. The cortex normally controls the lower levels through inhibition and reënforcement. Alcohol interferes with the regulatory functions of the cerebrum.

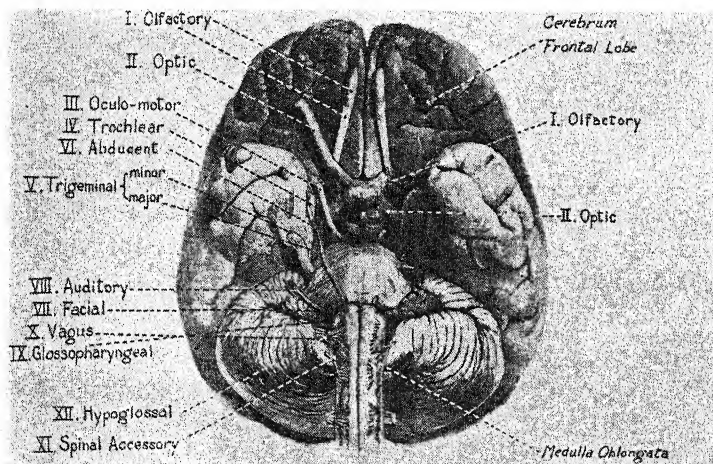
The ultimate control of our emotional experience is effected by the inhibitory influence of the cortex upon the thalamus. Alcohol, working from the top downward, affects the nervous connection between the cerebrum and the thalamus, paralyzing the inhibiting functions. The real man underneath comes out under the influence of alcohol, we say, but it may be questioned as to whether cerebral or thalamic behavior is the expression of the "real" individual. The removal of inhibition allows the thalamus freer rein, thus encouraging exaggerated affective reactions. The drunkard is happy, hic, oh, so happy, or way down in the dumps. The paralyzing influence on the inhibitory control of the cortex over the thalamus accounts for the illusory belief that alcohol is a stimulant.

When alcohol affects the connections between the cortex

and the cerebellum, the uncertain equilibrium so characteristic of the "drunkard's gait" results.

Further consumption of alcohol, by affecting still lower levels, may endanger the vital functions of respiration and circulation, thus suspending animation.

B. The Peripheral Nervous System. In addition to the central nervous system there is the peripheral nervous system, made up of the nerves outside the brain and cord. The peripheral nerves are classified in two groups, the



CRANIAL NERVES

spinal and the cranial, according to the portion of the skeleton from which they emerge.

1. The Cranial Nerves. Some of the cranial nerves are motor in function, some are sensory, and some are mixed. In man there are twelve pairs of cranial nerves, all of which find exit through holes in or between the bones forming the base of the skull. The first and second pairs differ from all the other peripheral nerves in that, developmentally, they are really outgrowths of the brain substance. The cranial nerves are:

- I. Olfactory (sensory)—connected with the organ of smell.
- II. Optic (sensory)—connected with the organ of sight.
- III. Oculo-motor (motor)—to certain muscles of the eyeball.
- IV. Trochlear (motor)—to a muscle of the eyeball.
- V. Trigeminal—sensory to face and tongue, motor to muscles of mastication.
- VI. Abducent (motor)—to a muscle of the eyeball.
- VII. Facial—sensory to tongue, motor to all muscles of facial expression.
- VIII. Auditory (sensory)—connected with the organ of hearing.
- IX. Glossopharyngeal—sensory and motor to tongue and pharynx.
- X. Pneumogastric or vagus—sensory and motor to viscera.
- XI. Spinal accessory (motor)—a portion joins the vagus; the other portion supplies two muscles of the neck.
- XII. Hypoglossal (motor)—to muscles of the tongue.

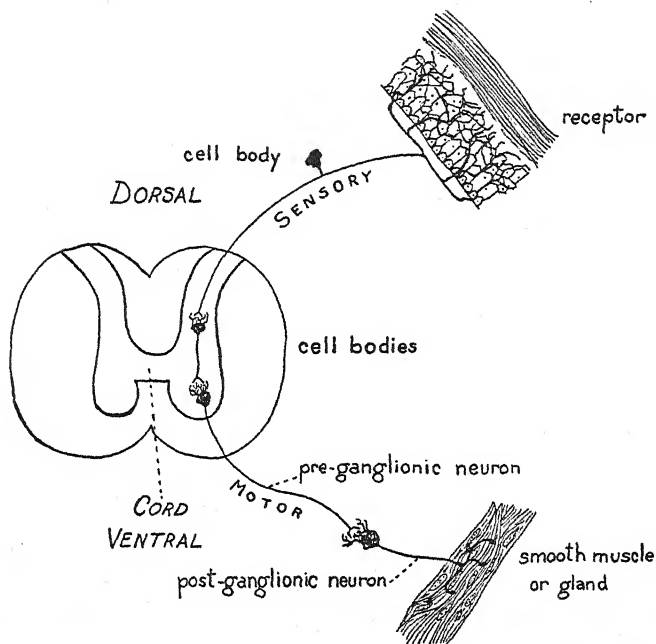
2. The Spinal Nerves. The spinal nerves pass out from the sides of the vertebral column between adjacent vertebræ. In man there are thirty-one pairs of spinal nerves named from the regions of the vertebral column where they emerge:

- | | | |
|----|--------------------------|---|
| 8 | Cervical—neck region | |
| 12 | Thoracic—region of chest | |
| 5 | Lumbar—region of loins | |
| 5 | Sacral | } —terminal portion of the spinal column. |
| 1 | Coccygeal | |

C. The Autonomic System. Outside the spinal cord is a chain of nerve fibers which make up the autonomic nervous system. The function of the autonomic system is motor only (not sensory). It controls the vegetative processes such as digestion and blood circulation, by regulating the glands and the smooth muscles of the viscera. The whole autonomic system is under the control of the central nervous system by means of the pre-ganglionic neuron.¹

¹E. J. Kempf: *The Autonomic Functions and the Personality*. Nervous and Mental Disease Monograph, No. 28, 1918.

What is the purpose of the relay—of the extra neuron that is interposed? The post-ganglionic neuron is non-medullated. Lacking the medullary sheath this neuron slows up the rhythm of the impulse. The slower rhythm is more suited to the smooth muscles which are called into action by the autonomic system. There is no need for



SCHEMATIC DIAGRAM TO REPRESENT THE AUTONOMIC RELAY (POST-GANGLIONIC NEURON)

the quick, rapid movements which are characteristic of the activity of the skeletal muscles. The smooth muscles around the digestive tract and the blood vessels function slowly but surely. The impulse to the skeletal (striped) muscles is direct; the impulse to the smooth muscles is relayed through the outlying (autonomic) neuron. The

vegetative processes, which are activated by the autonomic system, are not under direct voluntary control.

The autonomic system is organized in three sections—*cranial, sympathetic, and sacral*. The cranial and sacral divisions work together in opposition to the sympathetic. The cranio-sacral and sympathetic systems operate in the same organs, but with antagonistic reactions. The sympathetic dilates the pupil, the cranial contracts it; the sympathetic inhibits digestive and sexual activities, the cranio-sacral augments them; the sympathetic accelerates the heartbeat, the cranial retards it, and so on. Either the cranial and the sympathetic or the sacral and the sympathetic divisions innervate all organs where there is smooth muscle or gland.

Evidence is accumulating that the neural impulse in the autonomic system is transmitted to the smooth muscles by two chemical substances—acetylcholine and “sympathin.” “Sympathin” is closely related to epinephrine chemically, but is not identical with it. Acetylcholine is the chemical mediator in the post-ganglionic fibers of the cranio-sacral (parasympathetic) system. Dale has found that the depot from which acetylcholine is liberated is associated with the nerve-endings rather than with any part of the effector organ.¹ When nerves deliver impulses to a sympathetic ganglion, there is produced in the ganglion an appreciable amount of acetylcholine, and when acetylcholine is applied to the ganglion it has effects similar to those produced by the impulses themselves. It is suggested further that the impulse from the motor neuron to the skeletal muscles is mediated by the same chemical means.² Further research may reveal that nerv-

¹H. H. Dale: “Some Recent Extensions of Chemical Transmission,” in *Cold Spring Harbor Symposia*, Vol. 4, 143ff. 1936. Also “Transmission of Nervous Effects by Acetylcholine,” *The Harvey Lectures*, Series XXXII, 1937.

²A. Rosenblueth: “Neuromuscular Transmission in Somatic and Autonomic Systems,” in *Cold Spring Harbor Symposia*, Vol. 4, pp. 132ff. 1936.

ous impulses are transmitted through the synaptic connections of the central and peripheral systems in the same manner.¹

SUMMARY

The nervous system integrates the receptors and effectors so that behavior is expressed in an organized manner. Nerve impulses are conducted by nerve fibers which are made up of bundles of neurons. Conduction proceeds only in the forward direction because the synapse acts as a valve, preventing reversal.

Coördination is promoted by the final common path over which the prepotent impulse travels; by reciprocal innervation through which excitation and inhibition operate simultaneously in symmetrical members of the body, as in the movements of the right and left legs; by synaptic conduction which is irreversible; by facilitation through which allied responses reinforce each other; by summation through which stimuli evoke a response by combining to rise above the threshold of stimulation; and by inhibition, by means of which reactions are prevented from occurring, depending on prepotency and other complicating factors.

The nerve impulse is an electro-chemical affair. Each sensory nerve has its specific energy, that is, it gives rise to its own quality of sensation, regardless of the nature of the stimulus. The nerve impulse operates on an all-or-none principle, like a rifle cartridge; either it goes off entirely, or it does not discharge at all. A stronger stimulus excites more fibers than a weak one.

The nervous system is an organization of three systems: the central, the peripheral, and the autonomic. The central nervous system is the one in control, with the cerebral cortex as the most important level in the hierarchy.

¹For a more complete summary of the research on this subject, consult W. B. Cannon and A. Rosenblueth: *Autonomic Neuro-Effector Systems*. 1937.

The higher mental processes are governed by the cortex; emotional activities, the maintenance of equilibrium, respiration and circulation are delegated to the lower levels of the system. Though certain centers are localized for certain activities in the adult human brain, the cortex functions essentially as a whole.

The study of brain waves has demonstrated that neurons are continuously, spontaneously active. Stimulation merely alters the patterns of nervous discharge. Reactions to stimuli are determined, not by specific pathways "worn" by past usage, but, rather, by extensive patterns involving the body as a whole, patterns which are temporal as well as spatial in nature.

The peripheral nervous system consists of the cranial and spinal nerves, located outside the brain and cord.

The autonomic nervous system, solely motor in function, regulates the vegetative processes. It operates with a slower rhythm because the non-medullated post-ganglionic neuron slows up the rhythm of the nerve impulse. The cranio-sacral and sympathetic systems work antagonistically.

Through these various nervous systems our activities are organized into coördinated patterns of behavior.

MOTOR EQUIPMENT

THE INDIVIDUAL, informed by the receptors concerning the environment, makes the proper adjustments by means of his motor equipment. This adaptive behavior is carried out by effectors which consist of the striped and unstriped muscles and of the duct and endocrine glands. The patterns of action and reaction are muscular and glandular, whether we be engaged in eating, writing, talking, crying, or fighting. Our understanding of the way we behave will be improved by a study of the mechanisms through which our reactions are effected.

I. THE MUSCLES

A. The Striped Muscles. The human skeleton is a bony framework, consisting of about two hundred bones, upon which the body is hung and stretched. The skeletal or striped muscles usually are attached to the contiguous ends of adjacent bones. As the muscle crosses a joint, a lever is created which adds to the effectiveness of muscular exertion. In most activities such as lifting, running, and jumping, the muscles work with the coöperation of the skeleton.

A striped muscle with which everybody is familiar is the biceps muscle of the upper arm. The contracting of the biceps muscle causes the elbow to bend as the forearm and hand are raised toward the shoulder. It is chiefly by means of the biceps that the individual salutes the flag, raises a

glass to his mouth for drinking, or lifts his hand to part his hair.

The striped muscles, of which the biceps is only one example, constitute about one third to one half of the total mass of the body. There are over six hundred of them altogether. The uninformed person does not realize how many different muscles are involved in an activity like talking, to take a familiar example. When a person speaks, as he is exercising muscles to expand and contract the lungs and to move the diaphragm, air is forced through the vocal mechanisms; at the same time muscles are being used to regulate the opening and closing of the glottis (a narrow aperture between the two vocal cords), to shift the jaw bones, to wag the tongue, to open and close the lips, to say nothing of the muscles involved in varying facial expressions, changing postures, and, since many people talk as much with their hands as they do with their voices, producing the appropriate gestures.¹

The kinesthetic sense which is based on sensations mediated by the proprioceptors from the muscles, tendons, and joints, is basic in all athletic skills. The widespread patterns of muscular activity are apparent in playing a game like tennis. The tennis player must keep his eye on the ball, manipulate his feet to maintain the right alignment and balance for each separate shot, assume the proper grip peculiar to each type of stroke, move his arm through the correct arc with the appropriate amount of follow-through, run in the right directions and time every move with the utmost precision. Hours of practice are necessary in order to perfect the coördination of these muscular patterns before a person can play the game with finesse.

The teamwork of the muscles makes for strength, speed,

¹See Sara M. Stinchfield: *The Psychology of Speech*, Chap. 3, "The Physiological Bases for Speech." 1928.

and precision. No one of these is sufficient in itself. A man with powerful muscles may apply his strength in a wasteful awkward manner. Skill depends upon a coördination of all three factors. A good illustration of this fact is the small-sized well-coördinated golfer who can outdrive the husky awkward player because of superior timing. Coördination is the real basis of muscular skills.

1. Contractility. The striped muscle, as has been stated, is attached to the contiguous ends of bones by means of terminal cords which are called tendons. The

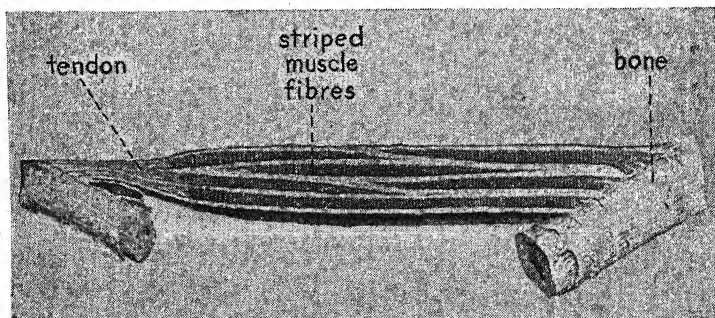
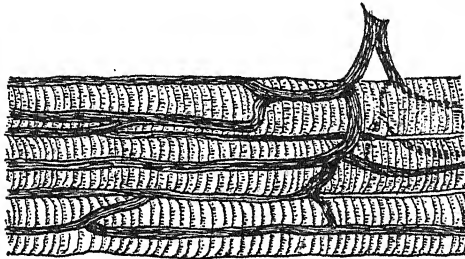


DIAGRAM SHOWING STRIPED MUSCULATURE SUSPENDED
BETWEEN TWO BONES BY TENDONS
(After Braus)

belly of the muscle can shorten when excited, thus exerting a pull upon the passive tendons which transmit the movement to the bones, just as a tug on a rope will pull a sled. The shortening of the muscular tissue causes it to thicken in diameter, and to become hard and rigid. When the young athlete asks you to feel his muscle, he contracts it so that you are impressed with the properties just described. The fundamental characteristic of a muscle is this contractility, the capacity to change from a long and narrow shape while at rest to a shorter and thicker form in activity, thus exerting a forceful pull on the bones.

Under the microscope the skeletal muscle is seen to be striated—hence the term “striated.” The muscle is composed of tiny fibers which are living cells specialized for the function of contraction. When hundreds of these small fibers shorten, the total force of the whole muscle is considerable.

2. Nervous Control. Muscular contraction may be evoked by mechanical, chemical, or electrical stimuli, etc., but the usual excitation for the shortening of the fibers is an impulse imparted by the motor nerve, the electro-



SCHEMATIC DRAWING OF STRIATED
MUSCLE FIBERS

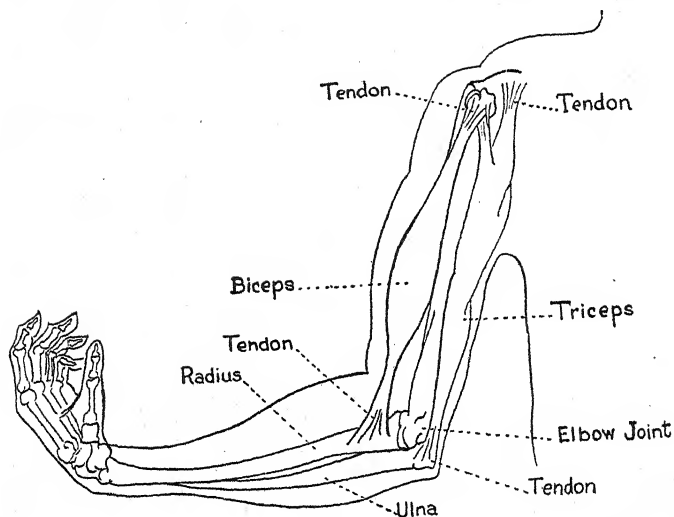
The capillaries are shown encompassing the muscle fibers.
(After Golgi.)

chemical processes of the nerve inducing chemical changes in the muscle. The phasic contraction of a muscle begins with a latent period during which the muscle remains unexcited, followed by a slow, a rapid, and a slow contraction in succession, concluded by a relaxation. The whole operation involves a mere fraction of a second.

A simple muscular act, such as tipping the hat, involves the whole body—for the entire physical mechanism must assume a certain set or attitude before the act can ensue. The organization of the reaction, of course, is taken care of by the nervous system through its coördinating functions.

3. Tonus. When the belly of a resting muscle is dissected, the two ends of the muscle draw away from each

other. This evidence indicates that even the resting muscle is kept in a slight tension continuously, probably by a constant stream of impulses from the brain and cord. The steady tension of muscular tissue is known as its *tonus*. In everyday parlance we speak of people being "toned up," or vigorous. The exact nature of tonus is not known. Functionally speaking, tonus is a condition of alertness, making for rapid response. The tonus is maintained by



SCHEMATIC DIAGRAM SHOWING ANTAGONISTIC MUSCLES IN THE ARM

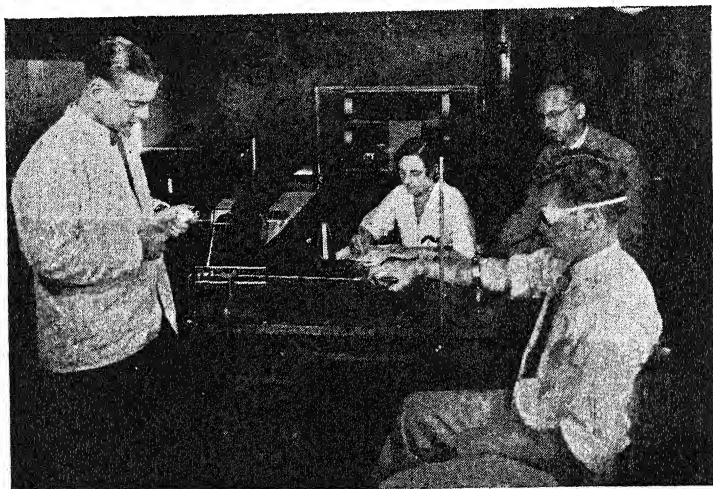
the cerebellum. In a spinal frog, whose cerebellum has been removed, the muscles become lax and sluggish. If the foot is pulled down, the leg will hang limp—the tonus is gone.

4. *Antagonism.* The muscles are arranged in antagonistic groups. In the arm, for example, there is the biceps which bends the arm and the triceps which straightens the arm. Because of their functions the biceps and triceps are sometimes called, respectively, flexors and extensors.

The direction of the force exerted by the two sets of muscles depends upon the ratio between the two tensions. When the flexors contract, the extensors relax, and vice versa. This reciprocal excitation and inhibition of antagonistic muscles is known as reciprocal innervation, as was explained in the preceding chapter. The antagonistic tensions promote the smooth functioning of the musculature so that movements of delicate skill can be executed. When a person raises a spoon full of soup to his mouth, there is a contraction of the biceps (of the arm involved) and a relaxation of the triceps at the start of the movement, but gradually the biceps eases up as the triceps comes more into play so that the motion of the spoon is slowed down as the mouth is approached. Antagonistic muscular groups in the hands and throughout the body enable the individual to balance the spoon with grace and precision so that no soup is lost in the passage from plate to alimentary canal. Even more beautifully coördinated, as muscle works against muscle in numerous complicated patterns, are the motions involved in the putting touch of a champion golfer or the operating techniques of an expert surgeon.

5. The Erect Posture. You may have noticed how fatiguing it is to stand still. The human body was never designed to remain upright. It was originally constructed to be used "on all fours." The internal organs were designed to hang freely from a horizontal backbone, like clothes from a line. The legs and arms were designed to serve as supports at the corners of a four-legged body, like a table. The spine was intended to be a girder, not a column. The upright position imposes a strain which involves a large proportion of the striped musculature. It is easy to understand, therefore, why standing still is very tiring—the muscles are under a constant strain with little relief through variation.

6. Muscular Work. Muscular activity is work which means that fuel must be utilized and converted into energy (metabolism). The food for the muscles is furnished by the sugar distributed to the muscles by the blood. Reserve sugar is stored in the muscles themselves, and is also stored in the liver in the form of glycogen. The reserve supplies in the liver are tapped by the endocrine glands



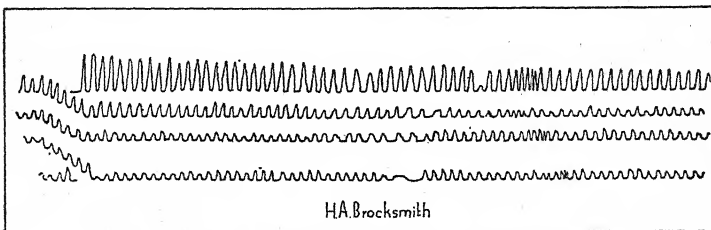
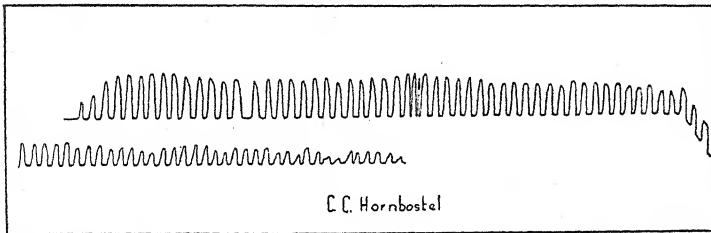
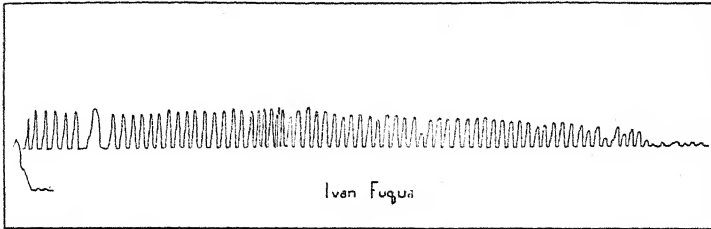
ERGOGRAF

In this experimental situation the subject raises a weight attached to the cord at the left by flexing the middle finger in time with the metronome.
(Reproduced by permission of D. A. Laird.)

which transfer the fuel to the blood stream, and then direct the supply of blood to the muscles. As the sugar is burned, fatigue products are created, the chief of which are carbon dioxide and lactic acid. These products are gradually carried off by the blood—the endocrine glands cooperating, as we shall see later, to minimize the conditions of fatigue. Experimentally muscular work is studied by using an ergograph, an instrument which calls

for the lifting of a weight by a finger, the contractions being timed to the beats of a metronome.

The ergograph test was given to three runners while they were training for their respective events, a few years ago. Each record reads from left to right. First is



ERGOGGRAPHIC RECORDS OF RUNNERS

Notice how each of the runners has trained to use his energy efficiently. Fuqua warms up at once and fades rapidly; Hornbostel warms up slowly and fades more slowly, steadily declining to the end; Brocksmith starts fast, fades, recovers, and continues with a small expenditure of energy for an extended period of time.

(Reproduced by courtesy of J. M. Harmon.)

Fuqua, a sprinter; second is Hornbostel, a middle-distance runner; and third is Brocksmith, a long-distance runner. The interpretation of their performances may yield light on the effects of specialized training on physical condition. Psychological factors may also be involved.

7. Exercise. Exercise is absolutely essential for the maintenance of healthy muscles. A muscle which remains unused atrophies, as may be seen in cases of paralysis where the nerve has been seriously impaired or destroyed.

The muscular tissues wither away until little is left. A person who has been confined to bed for several weeks, experiences considerable difficulty in walking. Athletic training hardens the muscles so that their power is increased. For the ordinary routine of life, however, no such force is required. Rest and exercise should alternate, else softness and exhaustion will ensue, as the case may be. Too frequently athletes train themselves to the point of exhaustion for the sake of Alma Mater, and to their own permanent harm.



**SCHEMATIC
DRAWING OF
SMOOTH MUSCLE
FIBERS OF THE
LONGITUDINAL
TYPE**

(After Burton-Opitz)

B. The Smooth Muscles. The smooth or unstriated muscles are found chiefly in the viscera—the “insides”—involving such organs as the stomach, intestines, veins, arteries, heart, lungs, and sex organs. The viscera are hollow organs mostly, the contents of which are constantly changing—the stomach (food), lungs (air), and heart, arteries, and blood vessels (blood). During the process of

handling these metabolic ingredients the visceral organs are reacting and thereby supplying stimuli that may impel the whole body to action. The contraction

of the smooth muscles in the stomach walls may provide the stimulus for the striped muscles to propel the organism to a restaurant. Visceral reactions may call the striped musculature into action in order to carry an urge through to its fruition.

Smooth muscles are also found in other parts of the organism—around the hairs on the skin, making it possible for the hair to stand on end; in the eye, adjusting the size of the pupil.

Two typical forms of smooth muscle are the longitudinal and the circular. The longitudinal unstriped muscle is found, among other places, in the intestine, where it serves to change the local length of the canal, in the alimentary tract, and in the stomach.

The circular arrangement is called a sphincter muscle, a type of unstriped muscle which regulates, among other things, the size of blood vessels and the pupillary movements of the eyes.

Both the longitudinal and the sphincter types of smooth muscle may be found in the same organ, as in the intestines.

1. Slow Contractions. Smooth muscles are less prompt in their response than skeletal muscles, and more independent. By voluntary effort a person may contract his striped muscles, but he is unable directly to contract or dilate his blood vessels through the operation of the unstriped musculature. The smooth muscles go about their business in a slow and steady manner; they discharge their functions with a reliability that insures the efficiency of the body as a whole. The post-ganglionic neuron of the autonomic system, you recall, slows up the rhythm of the impulse to suit the smooth muscles, which take their time.

2. Control. The unstriped musculature is regulated by two sorts of control—by the autonomic nervous system and by the glandular secretions.

3. Internal Stimuli. It is easy to fall into the fallacy of thinking that the stimuli which provoke our responses come solely from the external environment. It is important to note that many of the stimuli which excite us to activity are furnished by our internal processes and that there are receptors inside us to detect these stimuli just as the eye, for example, picks up the goings-on of the external world. Our "environment"—our world of stimuli—is not only one of external objects, sights, sounds, and smells; it is one of internal objects as well—hunger contractions, bladder distensions, palpitating heart, rapid breathing, and muscular changes.

II. THE GLANDS

The glands complete the motor equipment. Behavior consists not only of muscular responses, but also of glandular responses. Secretion responses are aroused by the stimulation of the sense organs. Tears may flow as a reaction to the presence of onions, to intense pain, or to sad news.

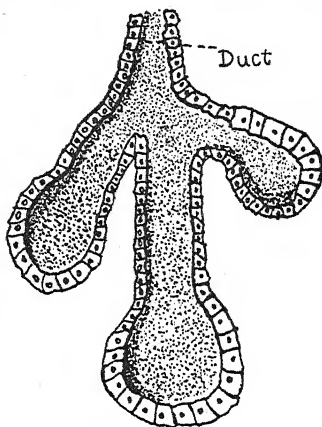
There are two types of glands: the duct and the endocrine glands. The duct glands have an outlet (duct) through which they secrete externally (sweat glands), or into the alimentary canal (salivary glands), or into the intestinal tract (the pancreas). The endocrine glands manufacture powerful chemical bodies which are absorbed into the blood stream, as the blood bathes the cells of the gland. It is quite possible that some of the duct glands function not only as such but also produce endocrine secretions. Such a possibility must be kept in mind. Further researches may confirm this presumption.

A. The Duct Glands. The duct glands pour their secretions through an opening.

1. Some Types of Duct Glands. *a. The Sweat Glands.* In the deep tissues of the skin lie the sweat glands. There

are about two million in the entire cutaneous surface. The duct is composed of smooth muscle cells, and makes its outlet through the pores of the skin. The sweat glands play an important part in hot weather in the maintenance of a constant bodily temperature, and also in the release of impurities injurious to health.

b. The Salivary Glands. The salivary glands are located in the mouth cavity. As we noted in Pavlov's experiments on the dog, saliva is secreted when food is presented or anticipated. The secretion facilitates the process of mastication and lubricates the alimentary canal for the downward passage of the food.



DUCT GLAND

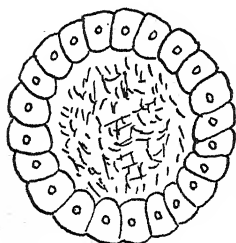
In the stomach and intestines are a number of glands secreting substances which serve to break down the food into chemical products that can be readily absorbed by the bodily tissues—the gastric glands in the walls of the stomach, the glands in the walls of the intestines which secrete intestinal juices, and, in addition, the pancreas and the liver. These various glands lubricate the alimentary canal, supply the enzymes which digest the food, and eliminate waste products from the blood.

c. Other Duct Glands. Some other duct glands are the lachrymal glands which secrete tears, the kidneys which secrete urine, the liver which secretes bile, and the sex glands (gonads) which secrete the substances necessary to reproduction.

2. The Duct Glands in Emotion. Cannon has demonstrated that during emotional excitement the glands in-

volved in digestion stop secreting.¹ When a person is experiencing anger or fear, for example, the digestive process comes to a halt, due to the cessation of secretion. If a meal is fed to a dog and he is then intensely frightened, hours afterward the meal may be found in his stomach, still undigested. The digestive process is stopped in an emergency. Emotional excitement occurs when vital adjustments must be made for self-preservation. At such a time there are other activities more important for the moment than digestion. If you find yourself suddenly in a dangerous situation, it does not make much difference whether your meal is being taken care of—the important thing is to act to survive—for digestion means little to a dead man. The organism, therefore, in an emergency, concentrates upon external action and neglects momentarily the contents of the alimentary canal.

It is poor psychology to quarrel at mealtime because it retards digestion. Bad temper is conducive to indigestion and indigestion aggravates bad temper—it is a vicious circle.



CROSS SECTION OF A
PART OF AN ENDO-
CRINE GLAND

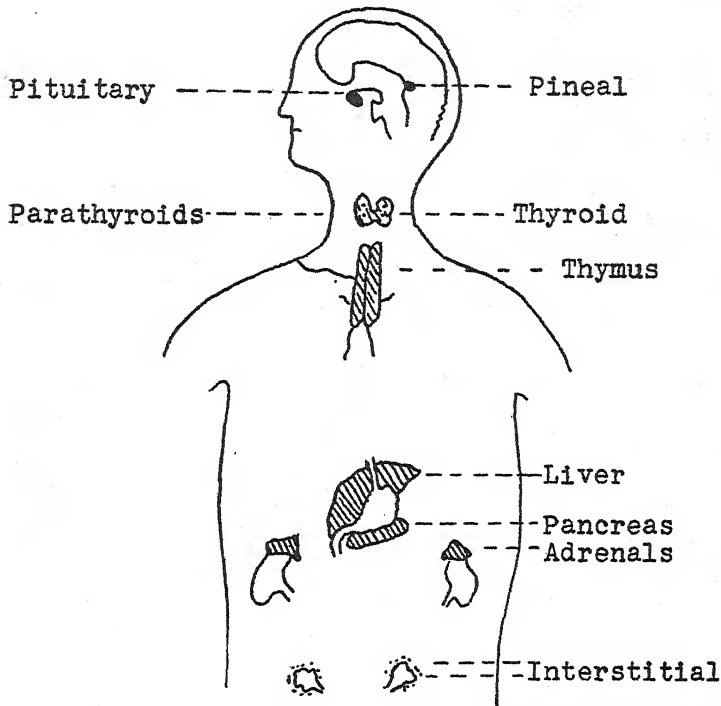
B. The Endocrine Glands. The endocrine glands exert an influence upon the body and mind, the importance of which was not suspected until comparatively recent times. The history of the experimental discoveries which have gradually enlightened the world in regard to the endocrine functions is a fascinating story.²

The cells of the endocrine gland secrete into the closed sacs which they surround. The secretion then passes out between the cells into the lymph spaces of the connective tissue.

¹W. B. Cannon: *Bodily Changes in Pain, Hunger, Fear, and Rage*. Second edition, 1929.

²See Benjamin Harrow: *Glands in Health and Disease*. 1922.

The locations of the principal endocrine glands can best be illustrated by the following diagram:



(From a sketch in Dashiell's *Fundamentals of Objective Psychology*.
By permission of and arrangement with Houghton Mifflin Company.)

1. Integration. The endocrine glands are the chemical regulators of the body, effecting an integration of the organism similar to the coördination secured by the nervous system. The nerves connect every part of the body with every other part—and the blood, as a transportation system for carrying substances, discharges the same coördinating function. The endocrine system produces a chemical integration of the total organism. The neural

mode of inter-connection, of course, is much faster than the glandular. The two systems, each with its peculiar advantages, coöperate to insure adaptive efficiency. The glands are reflexly excited under the autonomic nervous system. The chemical messengers carried by the blood stream are called hormones—from a Greek verb signifying “to stir up.” *Hormones* are substances formed by the cells of a gland and then distributed by the blood to other parts of the body where certain effects are produced. Every gland is a chemical factory in which the cells are the workers. The manufactured product is the hormone. Some hormones excite, some inhibit the organs they affect.

Whereas the duct glands pour out a considerable quantity of secretion, the endocrine glands produce only a minute secretion. A little of the internal secretion, however, will go a long way, since the hormones are extremely potent. Adrenin, one of the chemical messengers, can be detected by chemical analysis in dilution of 1:300,000,000—one ounce of the crystal, that is, to forty miles of water carts, each holding six hundred and twenty-five gallons and deployed two hundred carts to the mile. The hormones act chemically as catalyzers.¹ Thyroxine, for example, facilitates the oxidation process in the body.

Integration through the internal secretions is highly important.

There is good reason for the belief that this is the primitive method of control by which the various parts of the body are kept working in harmony. The chief lines of evidence are: chemical control is found in the lowest forms of animals and even in man; the so-called vegetative functions such as digestion or growth are preëminently under chemical control; reproduction, likewise, with its numerous bodily and psychic adaptations,

Q/1 ¹A catalyzer is a substance that accelerates a chemical reaction without appearing to undergo any change, itself, in the process.

is strikingly dependent upon hormone factors. It is perhaps significant in this connection that hormones seem to be completely interchangeable from one species to another. . . . This would seem to indicate that the hormones have been common factors from a remote ancestral period.¹

Arthur Keith, conservator of the Museum of the Royal College of Surgeons of England, believes that evolution has to a considerable extent worked primarily through hereditary variations in the endocrine glands.

The fact that the hormones of different species are interchangeable, is significant, since it makes possible the administration of animal hormones in the treatment of human glandular disorders.

Our knowledge of the specific functions of the various endocrine glands has been seriously impeded by the intimate interdependence of the glands. Disturbances in one gland involve changes, too, in other glands, so that it is difficult to determine the exact properties of any particular gland.

The endocrine system, in which the various secretions



GIANT AND THREE DWARFS

Illustrating effects of glandular disturbance.
(By permission of Keystone View Company.)

¹Julius Stieglitz (Editor): *Chemistry in Medicine*, p. 192. 1928. By permission of the Chemical Foundation, Inc.

balance or supplement each other, presides, in general, over four bodily functions:

1. growth
2. nutrition
3. sex
4. the vegetative process of gland secretion and involuntary muscle control.



EFFECT OF THYROXINE ON AN ADULT SUFFERING FROM A DEFICIENCY IN THYROID SECRETION

(Reproduced by courtesy of the Chemical Foundation, Inc., and Dr. E. C. Kendall.)

Endocrine disturbances produce serious deformities which may be observed in the freaks both in and out of the circus—the giant, the fat lady, the bearded lady, and the living skeleton.

2. Glandular Influence on the Personality. The effects of the endocrine glands on the psychic functions are

no less remarkable than on the physical. When thyroxine is administered for cretinism, the benefits that follow are expressed in improved mentality as well as in physical rehabilitation. The implicit responses which may be confined to the muscular and glandular systems inside the body exert a profound influence upon the mental life, all the more profound since it is so subtle. The stream of feeling which underlies our mental states originates, not in the brain itself, but in the viscera, muscles, blood vessels, and glands. The vegetative apparatus is the physiological correlate of that phase of mental life so loosely described as the subconscious. The term "subconscious" becomes more meaningful if we think of it in terms of the implicit responses which affect our moods and behavior in ways of which we are little aware. The glands may determine to a large extent the whole attitude toward life—whether life is worth living, as the familiar saying runs, depends on the liver. Psychology must look to the glands for an account of a large share of experience.¹

3. *Some of the Endocrine Glands.* The various glands have specific functions which have gradually been discovered by the painstaking research of the physiologists.

a. *The Pituitary Gland.* The pituitary gland is located beneath the brain just over the back part of the roof of the mouth. There are two divisions to the gland, the posterior and the anterior, which must be differentiated since they secrete separate hormones.

Only recently, in 1929, Oliver Kamm succeeded in isolating two hormones in the posterior lobe which are known as the pituitary twins, alpha and beta. The alpha hormone is important as a tonic for the uterine muscles in childbirth, while the beta hormone acts to raise the blood pressure, to quicken the respiratory rate, and to control the retention of water in the cells of the body.

Kamm

¹R. G. Hoskins: *The Tides of Life*. 1933.

The beta hormone is important in the treatment of burns. The difficulties in glandular experiment may be grasped by remarking that a single laboratory experiment of Kamm's required the posterior pituitary glands of fifty thousand cattle.

The hormone of the anterior pituitary gland controls bodily growth. A deficiency of this secretion will stunt growth so that a dwarf results. The midget Adams sisters, natives of Martha's Vineyard, were victims of such a glandular disturbance. Miss Lucy grew to a height of 43 inches and Miss Sarah to a height of 40 inches. As babies, they were of normal size, but it soon became apparent that they were not growing normally. The first shoes they had were made at home, for none small enough could be purchased. Their mother often measured their height to see if they were growing. When Miss Sarah was 19, she weighed just 40 pounds, and it had long since been accepted that both young women were destined to be midgets. For several years they appeared with the troupe of Mr. and Mrs. Tom Thumb, world-famous dwarfs.¹

6// Early overactivity of the anterior lobe of the pituitary gland results in gigantism. If the hypersecretion commences later in life, the bones of the face, hands, and feet become enlarged, producing a misshapen gorilla type 6// (acromegaly). A middle-aged English clergyman suddenly found his gloves no longer fitted him. Each time he bought a new pair he was obliged to take a size larger. With his hats it was the same way. He was outgrowing his shoes too. He hied himself to a physician who informed him he was suffering from acromegaly.²

¹The Boston *Herald*, October 24, 1930.

²Deviation in physical size has psychological consequences, particularly if the deviation is so extreme as to make a person obviously peculiar. "Freaks" are likely to develop feelings of inferiority because they cannot associate with people of normal size without attracting attention. Normal persons regard

Research on the pituitary gland may be illustrated by a description of an experiment performed at the Harvard Medical School. Two pedigreed thoroughbred English bulldogs, female littermates, aged four weeks, were received on March 1, 1927. They were observed in the laboratory, and were found to grow and behave as normal puppies should. On April 7, the animals weighed 4.87 and 5 Kg. respectively. Beginning on this date, daily intraperitoneal injections of sterile anterior lobe extract from the pituitary glands of cattle were given to the smaller of the two dogs. The heavier puppy was reserved as a control. By May 1, it became apparent that the dog which received the injections was growing faster than the control. From that time on, there was an increasing difference between their respective weights. By June, 1928, the dog given the extract was almost double the weight of her littermate. On June 14, a very warm day, the oversized dog succumbed to the heat and died. The heart and lungs could not stand the strain imposed by the artificially enlarged body.¹

b. *The Thyroid Gland.* Growth is not under the sole dominance of the pituitary gland. The thyroid gland, near the windpipe, also influences growth through its effect upon the rate of basic metabolism.² The hormone, thyroxine, contains about 65 per cent iodine. The activity of the gland depends upon the amount of iodine present. The thyroid through its hormone provides a means for maintaining a higher rate of metabolism than

such deviates with a morbid curiosity, with pity, and with an unpleasant sense of uneasiness. Happy social relationships are impossible under such conditions.

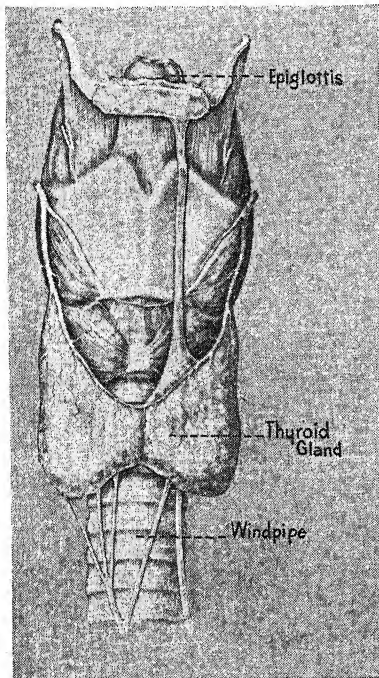
¹William Engelbach: *Endocrine Medicine*, I, pp. 72 ff. 1932.

T. J. Putnam, E. B. Benedict, and H. M. Teel: "Studies in Acromegaly: Experimental Canine Acromegaly Produced by Injection of Anterior Lobe Pituitary Extract," *Archives of Surgery*, 1929, 18, 1708-1736.

²Height, it should be noted, is also determined by the genes (units in the germ cells which condition the characters of the developed organism).

would otherwise obtain, and it also provides a means for varying the rate of metabolism to meet changing physiological needs.

The rate of basal metabolism is one important measure of thyroid activity. The



THYROID GLAND IN
POSITION RELATIVE
TO THE WINDPIPE
AND THE EPIGLOTTIS

(From J. B. Deaver: *Surgical Anatomy of the Human Body*. Copyright P. Blakiston's Son & Co., Inc., publishers.)

subject to be tested reports with an empty stomach, lies down on a cot, and relaxes, so that activity is reduced to a minimum. A mask is adjusted over his face. One tube brings fresh air and another tube conveys the expired air to containers where it can be analyzed and measured. The rate of oxygen consumption indicates the rate at which fuel is converted into energy. Individuals may normally vary 10 per cent below or above the average metabolic rate. Hypothyroids may fall as low as 60 per cent of the norm and hyperthyroids may rise as high as 160 per cent of the norm.

Thyroid deficiency means a slow heat pro-

duction (metabolism). A baby born with an inadequate thyroid develops into a stunted bandy-legged imbecile, with protruding abdomen and drooling tongue. Such a person

Q // is suffering from cretinism. His thinking and behavior are

sluggish. Emotional depression, lack of interest in things, and retarded thinking are characteristic symptoms.

Hyperthyroidism or oversecretion of thyroxine occurs in exophthalmic goitre, with rapid heartbeat, high blood pressure, elongation of the skeleton, and nervous excitability.¹ A person with excessive thyroid secretion is feverishly active, nervous, and is apt to suffer from insomnia.

c. *The Parathyroid Glands.* Anatomically associated with the thyroid are two pairs of glands known as the parathyroids, minute in structure. Removal of the parathyroids causes tetany (muscular convulsions) which issues in death. Early workers attributed tetany to removal of the thyroid. The mistake was easily made since in extirpating the thyroid they unknowingly took out the parathyroids too. The tetany is due to a blood deficiency in calcium which renders the muscles overexcitable. Oversecretion of the parathyroids lowers muscular activity to a subnormal level. Rapid decay of teeth in childhood indicates a parathyroid deficiency. The teeth often suffer decay in the pregnant mother as pregnancy provokes glandular disturbances. The iodine content of the thyroid hormone stimulates metabolism; the calcium content of the parathyroid hormone prevents overexcitability. A proper balance between iodine and calcium in the blood is necessary to bodily efficiency.

d. *The Puberty Gland.* The sex glands not only furnish an external secretion for reproductive purposes but also an endocrine secretion. The external secretion is supplied by the gonads (true sex cells). Situated among the gonads are the interstitial cells which constitute the puberty gland. During embryonic development the hormone from the puberty gland regulates the formation and growth of the primary internal and external genital organs. A special

¹Exophthalmic means "characterized by protuberant eyes."

hormone produced in the active uterus during pregnancy stimulates the development of the mammary glands in the mother, at the same time inhibiting the formation of milk, and at birth it is the cessation of this hormone which permits lactation to start. Sexual vigor is dependent upon the interstitial cells rather than upon the gonads, as most investigators had earlier supposed.¹ The castrated animal lacks pugnacity, his whole personality is altered, because his organism has been deprived of the hormone from the puberty gland. Eunuchs, with their high-pitched voices and their effeminate mannerisms, illustrate in the human sphere the effects of castration. When the secretion ceases at the menopause, bodily functions suffer a disturbance which expresses itself in symptoms of nervous tension. The rhythmical occurrence of ovulation in the female is associated with rhythmical changes in the secretions from the interstitial cells. The appearance of the secondary sexual characters at puberty is due to this same secretion—affecting the physical differentiations between male and female in respect to bodily shape, beard, breasts, height and weight, voice, and temperament. It has long been recognized that the eunuch differs in appearance and personality from the normal male.

Q11
e. *The Pineal Gland.* The pineal gland is a very small structure located in the brain itself. It develops until about the seventh year and then atrophies. The secretion of the pineal gland serves to hold sex development in check until puberty.

Q12
f. *The Thymus Gland.* The thymus gland, in the lower neck, like the pineal gland, acts to inhibit the premature growth of the sex glands and the premature appearance of the secondary sex characters. It is largest at puberty and then undergoes involution.

¹See C. L. Evans: *Present Advances in Physiology*, pp. 211-214. Fifth edition, 1936.

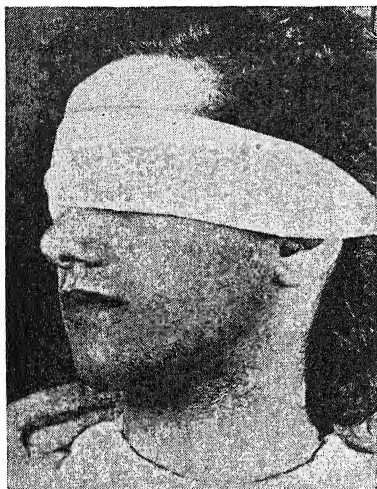
g. The Islets of Langerhans. The pancreas, located next to the small intestine, was considered solely as a duct gland until Langerhans discovered a collection of cells which differ in their microscopic structure from those cells known to be responsible for the secretion of the digestive juices. These cells were named the Islets of Langerhans and their hormone was designated "insulin." An insufficiency of the hormone insulin disorganizes metabolism with such resulting symptoms as increased sugar in the blood and sugar in the urine, symptoms of the disease known as diabetes. Metabolism in a diabetic may be compared to the retarded combustion of wet coal.

The treatment of diabetes includes the reduction of sugar-producing foodstuffs in the diet, and usually the injection of insulin to supplement the inadequate endocrine secretion. Early workers injected too much insulin, reducing the blood sugar so low as to produce convulsions and often death. An antidote for an overdose of insulin is an injection of adrenalin (adrenal gland hormone) which liberates sugar (glycogen) from the liver into the circulation. Normally the pancreas and the adrenal glands counterbalance each other to maintain the proper sugar content in the blood. The discovery of insulin as a cure for diabetes has been a great boon to humanity.

h. The Adrenal Glands. The adrenal glands are two small structures shaped like cocked hats and fitting snugly on top of each kidney. Each gland is composed of two parts, cortex and medulla, which have distinct functions. The secretion of the adrenal cortex acts as a detoxicating agent for certain poisons. Overactivity of the cortex leads to a marked accentuation of the masculine sex traits in either male or female. The adrenal medulla secretes a hormone which has been isolated and is known as adrenin, epinephrine, or adrenaline.

Adrenin evokes the same internal responses as are in-

duced by the excitation of the sympathetic portion of the autonomic nervous system. All the reactions of adrenin



HIRSUTISM

Photograph of a 16-year-old girl suffering from an adrenal tumor.

(Reproduced by permission of D. A. Laird.)

may be duplicated by the electrical stimulation of the appropriate sympathetic nerve. Emotional excitement provokes the secretion of adrenin which acts as a mobilizer of energy for a physical exertion which may be needed in a crisis. The organism is set for the emergency by means of the following processes initiated by adrenin:

1. The secretion of digestive juices is halted.
2. The heart beats faster.

George H. Austin, 46, an employee of the Eastman Kodak Company, was brought back to life by an injection of adrenalin. Respiration and heart action had stopped, the reflexes of the pupils had ceased, and the face had taken on the ashen color of death, when he was found collapsed on the floor by Dr. Benjamin J. Salter, chief of the company's medical staff. Under the influence of the adrenalin Austin's heart started beating again, and his life was restored.¹

- Q 11 3. The glycogen in the liver is converted into sugar and released into the blood stream. Anger sweetens the blood, but not the disposition.

4. The major part of the blood supply is transferred from the vegetative organs to the skeletal muscles so that

¹The Boston Herald, December 4, 1929.

there is less blood in the stomach and more in the arms and legs. Sugar is thus pumped to the muscles to provide the additional fuel for heavy exertion. Sugar not burned by the muscles may appear in the urine as Cannon noted in his investigation of spectators who had just undergone the emotional excitement of a football contest. A riot after a game is an apt method of burning up the excess sugar.

5. Fatigue products are neutralized or carried off by the increased blood supply. Adrenin will restore a fatigued muscle to a normal condition in five minutes where a rest of one hour would be necessary to produce an equivalent change.¹

6. The pupils are dilated to improve the clarity of vision.

7. The blood clots faster, thus preventing death in case of wounds.

Emotional excitement, involving, as it does, the adrenal glands with their preparatory measures for exertion, is a detriment to the adaptive activities of modern man.² Civilized competition is carried on in terms of intelligent maneuvers and not in terms of mere physical strife. Where the social code forbids assault and battery as a means of expressing antipathy, it is of no avail that the blood is pumped to the skeletal muscles. Being full of sugar is not conducive to that clear, quick thinking which is necessary to success in the struggle for existence as carried on under the present rules. It is most distressing to get "all riled up" and to have no adequate vent. The glands behave as if we were still primitive men fighting it out with our brute strength to determine survival. Instead of facilitating adjustment, our visceral tensions befuddle our wits and leave us emotionally distraught, feeling the urge to do something, yet hemmed in by inhibitions

¹See H. M. Johnson: "The Real Meaning of Fatigue," *Harper's Magazine*, January, 1929.

²Cannon, *op. cit.*, especially Chaps. 11 and 12.

which shut off our natural outlets. We laugh, sometimes, at a terrible-tempered person because he does the violent things to people we all would like to do at times. Pent-up emotions can only result in nervous disorder and unhappiness. Education must see to it that the viscera are trained as well as the brain.

4. The Endocrine System. The endocrine glands are intimately interrelated in their chemical regulation of the various bodily processes. They supplement and counterbalance each other to maintain a delicate equilibrium between the hormones. Through the endocrine glands, as well as through the nervous system, effective integration of sensory and motor equipments is secured.

SUMMARY

The striped muscles, smooth muscles, duct glands, and endocrine glands constitute the effectors for carrying out the adjustments we make to the world we live in. They are differentiated forms of protoplasm, adapted for executing our manifold responses efficiently. The activities of these motor organs are coördinated by the integrative processes of the nervous system and the endocrine system so that the organism can function as a whole with maximum effectiveness.

PART III
MOTIVATION AND ITS ORGANIZATION

Chapter 6 on "Human Urges and Motivation" will describe some of the drives which are responsible for human behavior. The incompatibility of these reaction tendencies produces "Mental Conflict" which is analyzed in Chapter 7, together with the defense mechanisms used in preserving peace of mind. The "Formation of Habits," Chapter 8, shows how our urges are built into habits by the process of conditioning, as the personality takes shape, determined in its growth by environmental influences and by its own natural potentialities.

HUMAN URGES AND MOTIVATION

MAN IS FUNDAMENTALLY a creature with urgent needs, the satisfaction of which brings a momentary cessation of desire. There is a will to live that keeps us going in search of the means of appeasing our desires, thus making both for self-preservation and the preservation of the race.

I. THE EMOTIONAL BASES OF HUMAN BEHAVIOR

What do human beings want? What do they desire? What do they crave? What do they need? An understanding of motivation is necessary for making a successful appeal to others, whether it be the minister endeavoring to arouse in his parishioners an enthusiasm for a better life, or the advertiser seeking to inculcate in the buying public a longing for a particular brand of soap.

A. The Evolution of Behavior Patterns. The newly born infant squirms about aimlessly, slashing wildly with his arms and legs, responding vigorously but indiscriminately to various forms of stimulation. His behavior is completely undifferentiated, diffuse, random. He "wants" food, for example, and he will respond in the same manner to a nipple, a finger, or a rattle. Patterns of behavior are non-specific, except for general tendencies to get more of some stimuli and to get less of others.

Adience and *abience* have been suggested to describe these two simple "tendencies" of early behavior. *Adience* refers to the tendency to continue or perpetuate some form

of behavior, whereas abience is used to indicate the fact that in certain situations the infant adopts a pattern of behavior which results in a diminution of a certain activity. "The immediate effect of an adient response, then, is to give the organism *more* of the stimulus that elicits the response; and of its opposite, the avoidance or abient response, the immediate effect is to give the organism *less* of the exciting stimulus."¹

Fondling a child gives rise to a visceral state of well-being, which acts as an adient drive to perpetuate the stimulus. Thus the love emotion may evolve, in part, from extensions and modifications of this primitive mode of reaction.² Reaching and grasping serve as motor responses to provide sensory excitation for further activity.³ A circular pattern is thus established which may account for the exploratory activities, the search for contact, and the delight in stimulation and activity, that constitute what is referred to as curiosity. The satisfaction derived from manipulating things generates a desire to appropriate objects for further exploration. Thus acquisitiveness develops. Acquisitiveness, curiosity, and love may emerge from the fundamental adient tendency as patterns of reaction become differentiated through experience.

The reaction pattern by which the organism removes itself from the source of stimulation is called the abient response; it is developed as the child learns by experience to avoid certain stimuli, such as harsh sounds, foul odors, or sour tastes. The restless movements which are engendered under such circumstances persist until withdrawal has been completed. This negative type of be-

¹E. B. Holt: *Animal Drive and the Learning Process*, p. 41. 1931.

²L. F. Shaffer: *The Psychology of Adjustment: An Objective Approach to Mental Hygiene*, p. 99. 1936.

³G. Murphy, L. B. Murphy, and T. Newcomb: *Experimental Social Psychology*, pp. 100ff. 1937.

havior seems to be less extensive than the positive or adient pattern.

The terms "adience" and "abience" are useful in describing the gross behavior of the infant. But when we turn to the adult human being, we find complex patterns of behavior which cannot be adequately accounted for on such a broad basis. The mature individual responds intently and with discrimination to a variety of situations. At certain periods during his day he pauses to fulfill his *urge* for food and at the end of his day he succumbs to the *need* for sleep. During much of his waking time he is in active quest of certain goals, near or remote, which he *wants* or *desires* or *wishes*; these goals may be simple and immediate, such as the approbation of the boss for a job well-done, or they may be complex and distant, such as the ambition to marry, some day, the lady of his choice and with her set out upon the task of making a home. He is influenced, too, by various *interests*; he may go out of his way to inspect a rare old book which he might like to add to his collection, or he may try to organize his work so that he can escape to a ball-game. His behavior is determined by certain *attitudes*, which limit his activities in some directions, encourage them in other directions. We see him rising vigorously to the defense and maintenance of *ideals* and *values* which he cherishes; he may risk his job by his courage in demanding better wages for his fellow workers, just as the hungry man may resist the temptation of stealing food because of his ideal of honesty.

Theories of motivation must explain the complex variety of urges, needs, wants, desires, wishes, interests, attitudes, ideals and values which activate human behavior. All of these terms refer to the fact that human activity is usually directed rather than aimless and random; they describe the fact that behavior is characterized by its orientation

towards some goal, whether that goal be tangible (as food) or intangible (as the ideal of virtue).

We shall not attempt an exhaustive analysis of all these factors which determine our behavior. For our purpose it will be wise to restrict ourselves to an account of some of the drives that motivate human conduct. The basic motivation is to be found in our emotions.¹

B. The James-Lange Theory. James and Lange called attention to the importance of organic changes in the emotional experience. James' exposition has received wide notice.

Our natural way of thinking about the . . . emotions is that the mental perception of some fact excites the mental affection called the emotion, and . . . this latter state of mind gives rise to the bodily expression. My theory, on the contrary, is that the bodily changes follow directly the perception of the exciting fact, and that our feeling of the same changes as they occur is the emotion. Common sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble and not that we cry, strike, or tremble, because we are sorry, angry, fearful, as the case may be. Without the bodily states following on the perception, the latter would be purely cognitive in form, pale, colorless, destitute of emotional warmth. We might then see the bear, and judge it best to run, receive the insult and deem it right to strike, but we should not actually *feel* afraid or angry.

Objects do excite bodily changes by a preorganized mechanism . . . the changes are so definitely numerous and subtle that the entire organism may be called a sounding-board, which every change of consciousness, however slight, may make reverberate.

¹See M. K. Thomson: *The Springs of Human Action*. 1927.

See also C. M. Diserens and J. Vaughn: "The Experimental Psychology of Motivation," *Psychological Bulletin*, 1931, 28, 15-65.

The various permutations and combinations of which these organic activities are susceptible make it abstractly possible that no shade of emotion, however slight, should be without a bodily reverberation as unique, when taken in its totality, as is the mental mood itself. . . . Every one of the bodily changes, whatsoever it be, is felt, acutely or obscurely, the moment it occurs . . .¹

The James-Lange theory excited a great deal of controversy, prompting Cannon, Sherrington, Head, Bard, and others to investigate the role of organic sensations in emotions. Nervous connections, for example, were severed in an animal so that the visceral reactions would not reach the brain and yet the animal seemed to express in his behavior what were apparently emotional responses. Evidence from experiments by extirpation, from the effects of anesthetics, and from pathological cases indicates that emotive responses are dependent upon a subcortical center, probably the thalamus, or, more specifically, the hypothalamus. Thalamic centers are ready for instant and vigorous discharge when they are released from cortical restraint, and are properly stimulated. The quality of the emotion is added to simple sensation when the thalamic processes are roused, as the latter not only innervate muscles and viscera, but also excite afferent paths to the cortex.² This theory fits all the facts: the presence of bodily changes in emotion; the short latent period; the emotional effects of assumed postures; the impulsive character of emotion; the conditioning of emotional responses through intimate connections between the thalamus and the association areas of the cortex. Thus the James-Lange theory has been considerably modified. The important point for our discussion is that bodily changes

¹William James: *Principles of Psychology*, II, pp. 449ff. 1890. By permission of Henry Holt and Company.

²W. B. Cannon: "The James-Lange Theory," *American Journal of Psychology*, 1927, 39, 106-124. Refer to Chapter 5 of this text.

constitute the physical basis for the conscious state we call emotion. Those changes are essentially central (thalamic) rather than peripheral (visceral).

C. Power. Physiologically, emotion means energy for physical exertion, as we noted in the description of the



THE DEPENDENCE OF ENERGY UPON INTEREST

(Reproduced by courtesy of the George Matthew Adams Service.)

work done by the glands. Psychologically, emotion means force, power, energy. For our purpose, let us assume that this life force expresses itself through the channels of the various emotions, inciting us to actions conducive to survival. Emotion, in its derivation, means *to move*. Emotions move us to behavior. They are *motives*, impelling us to activity. Energy comes especially

to those who get emotionally aroused.¹ Will power is a matter of interest. Provided you are normally healthy, if you want the drive that gets things done, all you need is incentive.

D. Mood and Temperament. Temperament has been defined as the predisposition to pleasant or unpleasant emotions. We speak of a sanguine temperament or a melancholy temperament.² The optimist is set to see the silver lining in the cloud while the pessimist can see only the cloud; the optimist is inclined to see the doughnut, the pessimist, the hole. Suppose it was sunny one day and rainy the next for a number of weeks. The sanguine individual would say the sun shone every other day, while the melancholy person would say it rained every other day. Temperament is a convenient term for describing dispositions that endure from infancy throughout life. It is definitely dependent upon the native biochemical constitution. According to Allport, "temperament refers to the characteristic phenomena of an individual's emotional nature, including his susceptibility to emotional stimulation, his customary strength and speed of response, the quality of his prevailing mood, and all peculiarities of fluctuation and intensity in mood; these phenomena being regarded as dependent upon constitutional make-up, and therefore largely hereditary in origin."³

Moods, on the other hand, are more passing. A mood is an emotional hang-over. Repressed or thwarted anger leaves a dynamic set for rage which may be touched off on the slightest provocation. A person who only awaits the opportunity to explode is in an ugly mood—ready to

¹W. F. Vaughan: *The Lure of Superiority*, Chap. 5, "The Sources of Power." 1928.

See also J. A. Hadfield: *The Psychology of Power*. 1924.

²P. T. Young: "Is Cheerfulness-Depression a General Temperamental Trait?" *Psychological Review*, 1937, 44, 313-319.

³G. W. Allport: *Personality: A Psychological Interpretation*, p. 54. 1937.

take out his feelings on the first victim who turns up. When a person is suffering from the blues, every stimulus becomes the occasion for further gloom. Everything seems to go wrong. Similarly, an individual in a suspicious mood finds adequate grounds in the most innocent remarks to confirm his feelings of distrust.

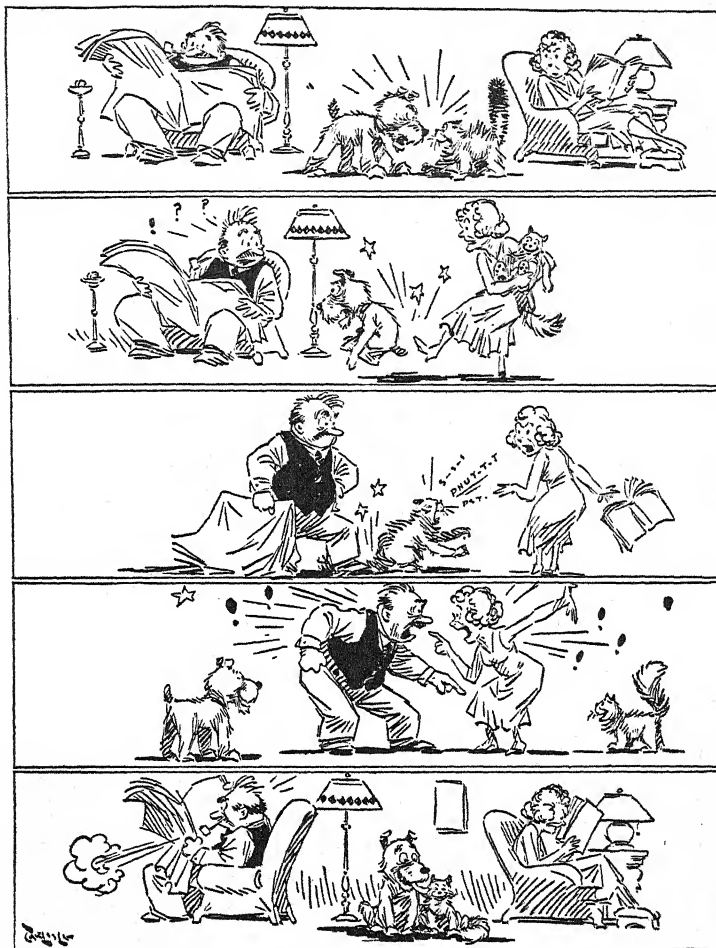
E. Emotions and Goals. Emotions, or urges, may be specified in terms of the way they feel, or in terms of the way they are expressed in behavior. In the latter sense, as I have just pointed out, there is a danger of misinterpretation unless the total situation is adequately understood.

Introspectively, each emotion is characteristically unique. The person who is experiencing the emotions is fairly clear in his own mind as to how anger, for example, feels differently from fear. Where the emotional state is complex, of course, self-observation is much more difficult. However, we can delineate the more elementary emotions with fair accuracy by a study of our own experiences.

Emotions can also be characterized by their expressions, with the reservations I have already indicated. For example, you would not mistake the exhibition on the next page as a manifestation of deep affection on the part of the human participants.

The obstacle in the way of reading the emotions of adults is the fact that we learn through experience to conceal our feelings. It is often wise for a person to hide his anger lest he provoke the ire of a stronger antagonist. It is essential to our pride that we disguise fear and jealousy. Love is a game in which much feigning precedes the ultimate surrender. Thus we pose and bluff—and often succeed in deceiving the observer.

The truth of the matter is, however, that adults are hopelessly inaccurate in observing the behavior of infants who have not yet learned the wisdom of hypocrisy, as is shown in some experiments conducted by the Shermans,



A STUDY IN EMOTIONAL EXPRESSION

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in which expert observers, after witnessing the emotional behavior of an infant, were requested to name the emotion. The conclusion is stated thus:

Most persons judge the emotional behavior of an individual in terms of the stimuli which have produced the reactions.

They have learned the names of a number of emotions, and have learned to evaluate various emotional responses in terms of the stimulating conditions which have aroused them. If the situation confronting an individual is estimated to be one which arouses an aggressive reaction, the resulting response is named *anger*, but if it is considered dangerous to his welfare, the response will be called *fear*. In this way the differentiation of emotions is based upon a knowledge of the character of the stimulating circumstances rather than upon differences in overt behavior.¹

The evidence gathered by the Shermans suggests that Watson's experiments on Albert and his subsequent observations on emotional conditioning represent a gross oversimplification of what actually transpires when a child is emotionally aroused.²

Since Darwin advanced his theory of evolution, there has been a disposition to interpret activities in the light of their usefulness.³ Our emotional reactions have survival value, preserving both the organism and the ego. "Back of living things there is an energetic drive to accomplish certain ends, which brings about a state of tension within the individual until its gratification is achieved."⁴

Emotion is the experience of being aroused in such a way as to feel the urge to do something. Widespread and profound organic changes (implicit behavior) and expressive movements (explicit behavior) are involved in emotion—but they are not the emotion. The consciousness of these physical processes constitutes the emotion. It is true that you can read my emotions only through my behavior. My emotion means behavior to you but to me it means something more than that—I feel as I behave. I know how it feels to be angry, and I can guess with some

¹Mandel Sherman and Irene C. Sherman: *The Process of Human Behavior*, Chap. 5, "The Observation of the Emotions." 1929. By permission of W. W. Norton and Company.

²See pages 29-30.

³Charles Darwin: *The Expression of the Emotions in Man and Animals*. 1920.

⁴Karl Menninger: *The Human Mind*, p. 266. 1930.

assurance that your anger is an experience very similar to my own—you feel hot under the collar, your heart thumps, you breathe in snorts, you clench your fists, you tighten your jaws, you gnash your teeth, and you have an impulse to hit, scratch, or take it out in some other way on your victim according to your own favorite manner.

Emotion supplies an impulse which requires for its satisfaction the doing of something by way of bringing a release of tension. The stirred-up state of the organism must find some outlet. Its purpose is realized when the goal of the behavior is reached. Activity is purposeful or at least purposive—it is directed toward ends.¹ Behavior can only be understood in terms of its goal.² A man may be stingy because he is greedy, or because he is caring for an aged mother, or because he has found “the girl” and has a home in view. A given act must be interpreted in reference to the purpose it serves in the individual’s emotional life.³

An urge is to be defined not by a specific pattern of behavior, but by the nature of the goal. The same end may be achieved by different modes of behavior, as in the case of two young men who want to be promoted: one of them gets to work on time, the other marries the boss’s daughter. On the other hand, the same pattern of behavior may be directed toward very different goals—running down the street may mean “going to a fire,” “training for the marathon,” or “catching a train.”

There are certain needs characteristic of human nature which function as incentives or interests. To follow these interests in an integrated way is to find happiness. Sometimes our interests work at cross-purposes so that the

¹“Purposeful” implies that the individual is conscious of the purpose which his behavior is realizing.

²Alfred Adler: *The Neurotic Constitution*. 1921.

³C. Macfie Campbell: “Mental Hygiene and Education,” *Social Aspects of Mental Hygiene*. 1925.

satisfaction of one want may defeat another. Coveting another man's property, for example, may involve the loss of social approval. Desires must be organized to accord with social experience. To win happiness you must satisfy your urges, and, further, you must learn to satisfy them in ways which are socially approved. All of our interests must be considered in a given situation. No single craving constitutes the one end in life.

II. BASIC NEEDS OR URGES

For purposes of convenience, human interests may be classified. These interests, propensities, or urges are not to be conceived as behavioral units but rather as tendencies toward seeking satisfactions for certain characteristic needs. From the vast conglomeration of human interests we may select a few of the propensities that are commonly thought of as basic to human nature. These urges are in no sense to be thought of as instincts, since learning plays such an important part in their evolution and in the determination of the particular means by which, in individual cases, satisfaction is attained.

There are several reasons for avoiding the term "instinct." For one thing, the word has lost its exact technical meaning at the hands of writers who abuse it. A sales manager for a life insurance company was engaged in a search for the motives that lead people to invest in insurance. One of the impelling urges, he found, as he ruminated on the subject, is the "savings instinct." The research was thus completed by the invention of a term.

Instinct is often confused with habit by popular writers. "The child," says one author, "at 7:30 instinctively goes to a certain spot, takes down a tooth brush in a certain manner. . . ."¹ Who ever heard of a tooth-brushing

¹James Langdon-Davies: "Education: Savage and Civilized," in *The New Generation*, p. 38. 1930.

instinct? The author means "habitually," not "instinctively."

The fundamental objection to the use of the term "instinct" is that it is mistaken for an adequate explanation of an occurrence, thus precluding investigation.¹ Instinct-psychology explains "human nature in terms of the fact that it is human nature."² Why do we fight? Because of the instinct of pugnacity. A social worker stated that "children who run away without reason and adults who do the same thing, are sufferers from *habitual nomadism*." Since *nomadism* means running away, the startling disclosure reveals the fact that people run away because they run away. A student once explained that crullers are doughnuts which cannot resist the pretzel instinct. It sounds all right, but it has nothing to do with reality. The same criticism applies to many situations where an instinct is arbitrarily invented to account for behavior. Explanations in terms of instinct are often either fantastic or tautological.³ The latter case was well illustrated in the diagnosis reached by a board of psychiatrists who examined a workman in Düsseldorf, Germany, who had confessed to eleven murders. "These symptoms," decided the psychiatrists, "betray a lust to kill."⁴

The term *urge* will be used instead of *instinct* for the above reasons, and *urge* is to be understood merely as a descriptive term. To call behavior "angry" is not to explain it, but merely to describe it by classifying it under a characteristic category of experience.

A. Hunger. Love and hunger are supposed to be the most potent drives in human nature. The satisfaction of

¹See "What Is Instinct?" *The Forum*, November, 1927.

²E. S. Robinson: *Practical Psychology*, p. 58. 1926.

³For a thorough criticism of the *instinct* concept, see L. L. Bernard: *Instinct*. 1924.

See also J. B. Stroud: *Educational Psychology*, Chap. 2, "The Instinct Hypothesis." 1938.

⁴*Time*, May 4, 1931.

hunger is conducive, obviously, to the preservation of the individual; the fruition of love, to the preservation of the race.

Seldom do most of us experience really intense hunger. Eating becomes a conditioned reaction so that instead of hunger we actually get only the bare experience, it's-time-to-eat-again. A meal becomes a matter of habit. Ravishing hunger is an unknown experience to many of us. To go for days without a meal on account of poverty or the inaccessibility of food, and not on account of illness, is to know the painfulness of starvation. In sympathy with the needy, a prominent business executive made the remark, which was widely circulated by the press, that if he were out of work and hungry, he would rather steal than starve—a dilemma which is no mere academic problem for many of the unemployed.

The pleasures of eating have become a dominant goal in the glutton. It is curious how people insist on eating when they get together, whether it be ladies at an afternoon tea munching between a perfectly good lunch and a hearty dinner, or men assembled at a banquet who feel they must gorge themselves before submitting to the dull oratory of the after-dinner speakers.

B. Love. It is love that makes the world go 'round. The observer has only to look at our songs, our movies, and our literature to behold how much mankind is pre-occupied with love.

The perpetuation of the species is insured through the medium of the powerful sexual urge. The biological goal of love is reproduction. There are observers who assert that parenthood is psychologically tied up with sexual satisfactions in such an intimate way that the indulgence of sex merely for momentary pleasure results inevitably in a sense of frustration. Parental love, supplementing mate love, yields a more lasting satisfaction.

The sexual emotion has played such a prominent part in modern psychology because mental conflict centers mostly around the adjustment of individual desire to the taboos laid down by the social order. In cultures like that of Samoa, where such taboos are absent, mental conflict does not constitute a serious problem.¹ Proposals intended to change the conventions of the sexual life in our culture are hailed by those who are set "in the good old ways" as mere encouragements for free love, whether disguised as trial marriage, companionate marriage, or what have you. All the commotion over the sex problem indicates that "something is wrong somewhere." Perhaps our institutions are not suited to human nature; perhaps individuals should be more willing to sacrifice their immediate satisfactions for the welfare of society as a whole. Certainly, adjustment of craving to taboo is a difficult task under the most favorable circumstances. Economic conditions which are conducive to late marriage have served to aggravate the problem. Subsidization of marriage, either by the state, or by the parents of the couple, has been suggested as one way out of this serious situation.²

According to Freudian psychoanalysis, the sex impulse is complicated by two pairs of interests, exhibitionism and voyeurism, masochism and sadism.

1. Exhibitionism and Voyeurism. The desire to show oneself, particularly to expose the body, is known as exhibitionism. The chorus girl is one case; Walt Whitman working in his garden in the nude is another. The evening gown is a medium of display. With many of us, exhibitionism gets a chance only in dreams when we find ourselves standing scantily clad in a hotel lobby, or on a prominent street corner.

¹M. Mead: *Coming of Age in Samoa*. 1928.

²G. Parkhurst: "Shall Marriage Be Subsidized?" *Harper's Magazine*, November, 1937.

Looking is technically known as voyeurism and is most characteristically seen in a Tom the Peeper who climbs a roof to peer through a bedroom window. More refined peepers go to musical comedies and burlesque shows.

2. *Masochism and Sadism.* Masochism is taking delight in being tortured. The girl who likes to be man-handled by a cave man is a masochist. Religious fanatics who scourge themselves, ascetics who deny themselves this or that, dancing marathoners, martyrs to illness, and some football players belong in the same category.



MASOCHISM

"Cheer up, Ed; there's another game next Saturday!"

(Reproduced by permission of *Judge*.)

Sadism is deriving satisfaction through inflicting cruelty. The practical joker, the he-man lover, the boy who pulls the wings off a fly, parents who punish their children violently, Dante describing the torments of the Inferno, Loeb and Leopold committing an atrocious murder, Jonathan Edwards preaching on hell, persons who enjoy bull fights or prize fights, individuals who are enthusiastically insistent that the criminal be duly castigated, are all sadists.

3
 Instincts
 supernal
 Reproductive
 Gregarious instinct (social living)

In 1930, a retired banker was arrested in St. Louis where he had established a dental practice. He was practicing dentistry, he said, in an unprofessional way. He had been pulling women's teeth for ten years in St. Louis, New York, Kansas City, and Joplin, Missouri. "I guess I get a thrill out of it," he explained.

The romantic ideal of love so well symbolized in the impetuous, self-dramatizing courtship of Romeo and Juliet has contributed in a large way to sexual maladjustment, for romantic love is most evanescent. It comes and presently it is gone. You cannot tell much about a girl's disposition, tastes, intellect, or sense of values by climbing her balcony in the moonlight.

Lovers who have nothing to do but love each other are not really to be envied; love and nothing else very soon is nothing else. The emotion of love, in spite of the romantics, is not self-sustaining; it endures only when the lovers love many things together, and not merely each other. It is this understanding that love cannot successfully be isolated from the business of living which is the enduring wisdom of the institution of marriage.¹

According to the romanticists there is one fated romance in store for each of us which comes to pass when by some coincidence affinities meet. Love is not something that a man does, it is something that happens to him. Love may come and just as mysteriously it may go. In its presence he is helpless. Marriages are made in heaven, compatibility is instinctive, happy unions are just lucky accidents. When true love exists, nothing need be added; when it does not exist, no substitute will take its place. When the dream girl and the prince meet, they marry and live happily ever after. So say the romanticists.

Married life cannot be one continuous thrill, one prolonged glamorous ecstasy. The romanticists take too

¹From Walter Lippmann: *A Preface to Morals*, pp. 308-309. 1929. By permission of The Macmillan Company, publishers.

W. Lippmann's theory of romanticism

much for granted in assuming that, with the right person, things will take care of themselves. They see habit formation as an evil to be resisted instead of welcoming it as an opportunity to be used. Compatibility is a process and not an accident. It depends upon the maturing of desire through a process of mutual adaptation. Marriage is a venture calling for the development of a system of coördinated habits by husband and wife. If meals are always on time, this is a family habit; if they are never on time, this is still another habit, and one to which the members of the family must adjust themselves. Quarreling, nagging, sulking, and weeping grow, by episodes, into established habits. With the passing of the years there is more and more of the life of the home that can be taken for granted, since the modes of living have matured into recognized customs. When this process of habit-building is effected through forethought and self-discipline, the psychological foundations are laid for the creation of those patterns of coöperation which constitute a happy marriage.¹

It would be folly to disparage the value of romance. There is, however, a tendency for the romantic cult to rely too much upon the magic of destiny and too little upon the advantages of individual effort. Passion transmutes an ordinary attachment into a thing of beauty, but persistent adjustment is necessary to sustain its continuity.

The technique of love is an art for which there should be thorough preparation. Instinct, as popularly conceived, is an insufficient guide for the solution of problems so vital to the achievement of happiness. Young people contemplating marriage should have access to competent instruction in matters affecting their emotional natures so that their union may be psychologically complete. The

¹See Robert C. Binkley and Frances W. Binkley: "Should We Leave Romance out of Marriage?" *The Forum*, February, 1930.

widespread failure of marriage would seem to indicate that something more than the conventional mode of unpreparedness is needed.

Natural impulses must, of course, be socialized through education. Desires provide momentum but they must be controlled and directed if a person is to grow into a mature human being. The responsible individual must appreciate the necessity of paying heed to the mores of the group, since his happiness depends, to a larger extent, upon the favorable recognition he gets from his fellow beings. The sex life must be made socially responsible by lifting conduct from the level of impulse to the level of social behavior.¹

Parenthood, as has been said before, is the psychological as well as the biological outcome of mate love. The family is needed to give the sex relation its greatest emotional value, to rear children in an atmosphere of intelligent affection, to socialize the individual, and to prepare the child for satisfactory mating in the future.² The ideal marriage provides the opportunity for a satisfaction of the sexual craving, for a fulfillment of biological destiny, for the enrichment of personality, and for guiding the children to happy maturity.³

C. Fear. What are we afraid of? Watson tells us that infants can be frightened by a loud noise or the removal of support.⁴ Watson's statement must be modified in the light of more recent studies. A loud noise, for example, is

¹See E. R. Groves: *Personality and Social Adjustment*, pp. 30-31, 121-135. 1923.

²E. Sapir: "What Is the Family Still Good For?" *The American Mercury*, 1930, 19, 145-151.

³B. Glueck: "Psychoanalysis and Child Guidance," *Mental Hygiene*, 1930, 14, 813-827.

⁴English found that a loud sound is not always frightening. One child he studied was not scared at all by a loud noise. See H. B. English: "Three Cases of the 'Conditioned Fear Response,'" *Journal of Abnormal and Social Psychology*, 1929, 24, 221-225.

not in itself the fear-provoking stimulus. The suddenness and the novelty of the stimulus, together with the degree of security felt by the child, are just as important as the intensity of the loud sound. A child who manifested fear of a loud noise when he was alone, remained indifferent to the sound when he was held by his mother.¹

The unexpected character of the stimulation provided by Watson was probably the essential provocative of fear, since the reaction of the child depends not merely on the objective stimulus but on the subject's lack of preparedness.² Jones investigated the fear responses of children from three months to 7 years old and arrived at the conclusion that the arousal of fear is due to the total situation, that is, the child experiences fear when he is suddenly confronted with a situation for which he has no ready reaction. The element of the unexpected is the determining factor in exciting fear. Older children who have had a wider experience and the advantage of maturing intelligence may react with curiosity or anger to stimuli that provoke fear in the younger children.³

Any stimulus which makes us feel insecure arouses fear.⁴ Thus a noise in the dark conditions the fear of the dark, while a noise in the daylight does not condition a fear of the daylight. It is the element of the unfamiliar that is usually alarming, alarming because it undermines the feeling of security. Security in this sense involves not only the desire for physical safety but the felt need for affectionate relations with others whose loyalty can be relied upon through every vicissitude. Horney has ob-

¹See C. W. Valentine: "The Innate Bases of Fear," *Journal of Genetic Psychology*, 1930, 37, 394-420.

²See M. C. Jones: "The Development of Early Behavior Patterns in Young Children," *Pedagogical Seminary*, 1926, 33, 537-585.

³See M. C. Jones: "The Development of Basic Emotions," in *The Child's Emotions* (Symposium). 1930.

⁴Alfred Adler has asserted that the longing for security is a deep-seated desire in human nature. See his *Neurotic Constitution*. 1921.

served that children who are frustrated in this need for affection are prone to be timid and fearful, that is, their threshold for fear is low.¹

In our modern life, one of the most important elements in providing a sense of security is a job. In families dependent upon the pay envelope from week to week for their livelihood the possibility of unemployment is a constant source of worry. Worry is a chronic state of fear which renders the attainment of happiness impossible. In the daily lives of most men and women, fear plays a greater part than hope. The most insidious worry of all the vast working population is due to the insecurity of employment.²

Convention is based upon respect for public opinion which at bottom is largely a fear of the insecurity that would ensue were nonconformity to provoke the wrath of the community. There is a time and a place for any given mode of conduct, and woe be to him who thinks and does otherwise. It takes more than ordinary courage to flout convention, since rebellion against the accepted ways of doing things upsets a lot of people, and in their eagerness to regain their traditional security they will not hesitate to avenge themselves upon the disturbing culprit, by gossip, social ostracism, or even physical punishment. If workingmen think freely about property, the rich are endangered; if young men and women think freely about sex, morality is undermined; if soldiers think freely about war, military discipline is weakened. It is fear that keeps us chained to the conventional; it is fear that impels us to goose-step for our security.

Primitively, the fear of physical danger was most important, as wild animals and the unruly elements were constantly threatening life. Civilization has minimized

¹K. Horney: *The Neurotic Personality of Our Time*. 1937.

²Whiting Williams: *What's on the Worker's Mind*. 1921.

many dangers, only to introduce new possibilities for injury. No savage ever had to worry about the harmfulness of steam heat. But the vendor of devices for moistening the air in our homes assures us that dry air sucks the humidity from our bodies, injures the tender mucous membranes of the throat and nose, dries the skin and scalp, and exposes the lungs to dust, so that people are rendered susceptible to colds, catarrh, constipation, headaches, sleeplessness, grippe, pneumonia, tuberculosis, and bronchitis. We can depend upon the advertisers—and insurance men—to keep us informed of impending disasters.

Far more upsetting than physical harm is the host of threats to the esteem in which one is held by one's fellows. Costly advertising campaigns magnify the blemishes and ills to which the flesh is heir so that readers are induced to purchase the magic remedies guaranteed to bring quick relief. Thus some disease may be avoided that might leave a tragic aftermath of broken hearts, engagements, and business careers, for no one can succeed who has "eructosis."

The fear "I won't make good" is the greatest and most common fear of all, according to David Mitchell, a clinical psychologist. We all have had a normal and healthy fear at times that we might not make good in certain situations, such as dealing with the boss, or making a speech, or meeting a customer, and the like; but with some people it has become so chronic that it crushes the heart out of them, saps their nerve, and militates against their succeeding. This fear grows out of the demands made upon people to try things which are beyond their physical, mental, and temperamental capacities. Our schools are the worst offenders in requiring children to attempt tasks which a large share of them are unable to accomplish. In setting up such foolish demands and false standards, the schools

actually drill into the children the habit of fear and the feeling of failure.¹

Stagefright in the presence of an audience is occasioned principally by the self-conscious query, "I wonder what kind of an impression I am making?" Many students fear to recite lest the exposure of their ignorance classify them among the stupid. Heine was reciting a poem at school exercises when he suddenly caught sight of a little girl in the audience, of whom he was secretly fond. He fainted. Many a person has been thrown into a panic by the mere thought of having to face an audience. Sarah Bernhardt never overcame her stagefright. Disraeli's first speech in Parliament was a complete failure. Russell Conwell forgot his speech when he arose to debate as a member of the team at Wilbraham Academy, vowed he would never try again, and then in later years became internationally famous as a lecturer. With most of us it is the fear that we may not do ourselves credit, that we may even disgrace ourselves beyond redemption, that makes a public speech such an ordeal—for both the speaker and his audience. The malady is not really the fear of the audience but the fear for ourselves, lest we fail to please. As soon as we begin to worry about what the audience is thinking of us, we are lost. The love of esteem exaggerates the dread of humiliation.

Assuming that fear has been aroused, what are the characteristic reactions? The most typical behavior patterns are paralysis, fleeing, or fighting.

Being rooted to the spot in terror or lying motionless in bed at the sound of intruding footsteps are forms of the paralytic response. It is a common experience in nightmares to be unable to move as the pursuer approaches. Speculating in an evolutionary manner, such paralysis

¹See Albert E. Wiggam: "What Are You Afraid Of?" *The American Magazine*, October, 1927.

probably is related to the death-feigning proclivities of certain animals who escaped the attention of attacking beasts by remaining stationary against the background, or who evaded further onslaught by assuming the appearance of death. "Playing 'possum" is a familiar example of this adaptive response. Death-feigning has its limitations in the modern world where standing paralyzed in the middle of the street is hardly the most effective way of convincing the automobile driver that it is no use hitting us—even though his insurance may permit him to run down his quota for the year. Similarly, standing speechless on a lecture platform does not enable us to fit so perfectly into the background as to elude the peering eyes of the audience, nor does it help our cause to feign death even though our imposture be most convincing.

The only thing to do in such a predicament is to flee—literally or figuratively. We can make a graceful exit and beat a hasty retreat, or we can say that we're not much as a public speaker and then go on to demonstrate our apology. Or we can flee by refusing ever to speak again—for which everybody will be thankful. Or we can make our flight into daydreams of stirring oratory in which we hold our listeners spellbound.

In the physical sense, fear may precipitate a headlong rush for cover. The anecdote of the soldier who was passed by a bullet and who later passed the bullet is a case in point. The story is told of a boy clad in a red sweater who found himself in an enclosure with a charging bull. The lad took to his heels and jumped the high fence, clearing it by a wide margin.

Another typical reaction of fear is fighting. A person who is scared will become pugnacious, particularly if he discovers that he can overcome his intimidator. Anger frequently issues from fear, for we tend to hate what we fear, since our personal security is threatened. Tyranny

in the state leads to bloody revolution, in the prison to violent riots, in business to vicious strikes. The employer, therefore, who resorts to intimidation to get the most out of his employees is courting disaster, notwithstanding the gospel of Judge Gary who wrote:

Fear of losing his job is making the man in the shop toe the line. At first glance the average individual will say that there is something very ugly and inhuman in that statement. It isn't ugly and it isn't inhuman. It is the sane and reasonable answer to the industrial tangle. It is its only solution. Fear is the word I used. I might, with equal truth, have said competition. They mean the same thing in industry.¹

It is to be hoped that the new economic order which is in process of emergence will appeal to higher motives, for industry as a coöperative enterprise must elicit good will.

A phobia is a morbid fear, morbid in the sense that repression of an earlier experience has minimized or even eliminated awareness of the sources of the dread. Claustrophobia is a well-known phobia, the fear of closed places. Such a fear may go back to a forgotten incident of childhood when, for example, the father shut the child up in a closet as a punishment. The sense of terror might carry over to affect the person in later life, so that he would be frightened at being in a room with the doors closed, without being able to account for his acute uneasiness. In one case, a young man could not be induced to enter a subway. Investigation revealed that some years before his drunken father had locked him in a closet to punish him, and had then forgotten all about him until the next day when he sobered up enough to think of releasing him. When Floyd Collins was trapped in his living tomb in Sand Cave, the fear of closed places was probably encouraged in the minds of many news readers.² The dread

¹Elbert H. Gary, in the *New York Times*, January 9, 1921.

²John E. Pember: "Cave Reactions of Collins Case as Seen by a Professor," the *Boston Sunday Herald*, February 22, 1925.

of being buried alive is another expression of this same phobia.

Some overenthusiastic individuals have advocated the elimination of fear from human life. Such a goal seems not only unattainable, but even undesirable. Fear has its functions in promoting caution, providence, foresight, and wisdom. Further, fear often adds a zest to life, whether it be a ride on a roller coaster or an expedition to the South Pole.

Ignorance may be bliss, but, as a general rule, it is unwise to undertake a hazardous venture by ignoring danger.

It is often helpful in controlling fear to become enveloped in another emotion such as anger or love. When a person gets mad enough, his adversary no longer terrifies him. Peril is forgotten in the enthusiasm for conquest. Similarly, "perfect love casteth out fear." We can afford to live dangerously if we have the confidence that comes with religious faith, with the sense that there is a Power higher than ourselves lending us support. Faith, of any sort, is a potent means of controlling fear.¹

Another method for overcoming fear which is sometimes effective is to do the thing of which we are afraid.² If an individual is afraid to make a speech, he should force himself to make one; if he is afraid of staying in the house alone over night, he should compel himself to do it. Hal Winkler, famous goaltender, took up goaltending in hockey when his brothers called him a "sissy." It is one of the rules of flying psychology to go up in a plane immediately after an accident. When Lindbergh and Miss Morrow experienced a mishap on one of their early flights, they made it a point to fly again the next day. Thus they gave fear no chance to dim their courage.

¹See Basil King: *The Conquest of Fear*. 1921.

²See H. L. Wilson: *Oh, Doctor*. 1923. This novel is the story of a young man who resorted to daring exploits in order to prove that he was not "yellow."

D. Anger. Anger is provoked by the thwarting of some desire. When an urge is blocked, an incentive is supplied for overcoming the obstacle. According to Watson, rage may be evoked in an infant by hampering his movements. Jones, however, found that mild restraint did not provoke an angry response; rage did result when restraint was suddenly and intensely applied.¹ A newborn infant will react with diffuse and generalized movements when the experimenter produces a gentle pressure on the infant's nose, by holding it between the thumb and index finger in such a way as to close off the nostrils. Pratt, Nelson, and Sun, who used this technique, do not feel that the heterogeneous responses evoked by the pressure constitute a pattern of behavior that can be legitimately specified as rage.²

Adults are usually angered by restrictions which hamper the satisfaction of some desire, whether the restraints are physically or psychologically imposed. Dembo assigned impossible tasks to her adult subjects, such as throwing a ring ten times on a distant bottle. Anger was manifested by swearing and by threats of abandoning the experiment: Dembo's analysis showed that the rage response resulted from a conflict between pride and a sense of incompetence. Barriers which constrain action produce the tensions characteristic of anger. Thus, conventional taboos prohibiting the individual from fulfilling his wishes serve to generate rage.³

Thwarting of self-assertion appears to be the most common cause of anger among college students. Meltzer had 93 students record their anger experiences for one

¹M. C. Jones: "The Development of Early Behavior Patterns in Young Children," *Pedagogical Seminary*, 1926, 33, 537-585.

²K. C. Pratt, A. K. Nelson, and K. H. Sun: *The Behavior of the Newborn Infant*. Ohio State University Contributions in Psychology, No. 10. 1930.

³T. Dembo: "Der Ärger als dynamisches Problem." *Psychologische Forschung*, 1931, 15, 1-144.

week. The frequency of anger episodes varied from 1-15 for the men and 1-14 for the women. The length of the episodes ranged from one minute to two days. Rage was preceded by such predisposing circumstances as fatigue, hunger, pain, boredom, hurry, and disappointment. Most of the episodes were attributed to the thwarting of self-assertion, the women being upset mostly by persons, the men by shoestrings, alarm clocks, and automobile tires, gone awry. In about one half of the cases the reaction of the subject was non-adaptive. The study suggests that there are "as many different manifestations as there are configurations of behavior patterns and social situations."¹ Meltzer's findings were, in general, confirmed by Gates who conducted a similar investigation with 51 women college students as subjects. Again, the thwarting of self-assertion appeared to be the predominant cause of anger. Persons rather than things were mostly responsible; responses were mostly verbal. The more violent the anger, the longer the emotion lasted and the greater was the variety of responses.²

The characteristic behavior pattern in anger is pugnacious attack. When a person "sees red," he strikes out in the hope that he will hit his adversary—or a bystander—or somebody. The urge to violence must vent itself before a return to a peaceful state of mind is accomplished. When the path to the fulfillment of desire is blocked, something must be done about it. War, either nationalistic, private, or family, is a wholesale outlet for the emotion of anger. Less harm is done when an individual stops to break the barrel stave that has risen to smite him on the shin bone. One man was so infuriated by his automobile which stalled that he seized the crank and beat in the

¹H. Meltzer: "Students' Adjustments in Anger," *Journal of Social Psychology*, 1933, 4, 285-309.

²G. S. Gates: "An Observational Study of Anger," *Journal of Experimental Psychology*, 1926, 9, 325-336.

hood and radiator of the car, deriving a vicious satisfaction from his violence until he was arrested for disorderly conduct.

There are people who are foolish enough to say that we shall always have war because human nature is what it is. However, human nature can be directed if an intelligent effort is made. Dueling has vanished in most countries in spite of the prediction that the practice would be permanent since human nature was built that way. In a public debate in 1858 the Reverend W. G. Brownlow maintained "that slavery having existed ever since the first organization of society, it will exist to the end of time." Yet slavery has been abolished in many countries. In spite of the cynics we have traveled a long way from the cave-man. Our civilization itself is a demonstration, however feeble it may be, of man's effort to curb his turbulent emotions for his own good as well as for the good of the whole.

Anger can be controlled if the proper means are taken. It can be restrained, in the first place, in respect to the stimulus. One person will get mad at a slighting remark while another will make a joke of it. The difference is a matter of attitude. A man is no bigger than the things that make him mad. Our reactions reveal our weaknesses. If a person places a proper estimate on his own worth, he is less likely to be tormented by a deprecatory remark. Nine times in ten, the woman too easily insulted flatters herself. If an individual is puffed up with pride, his pomposity is more easily punctured.

A man wrote to Dr. Cadman: "I am ashamed to say I am called 'touchy,' and someone recently told me when I resented the omission of my name from the speakers' list of our club social that I had an inferiority complex. How can that be, when I don't feel inferior?" Dr. Cadman's reply was: "But you do, and you confessed the feeling in your resentment. . . . Knowing the bait to which you rise, don't bite. Fore-

warned is forearmed. . . . A complete diagnosis by yourself of yourself will result in your being less liable to anger when others pass you by. Instead of sleepless nights over slights which may be imaginary, you can indulge a quiet chuckle over your own eccentricities."

A large share of the occasion for anger, just as Santayana said of love, lies in our own minds. We are set to interpret the stimulus in a certain way, we draw our own inferences, and we get mad. Suppose I make a statement of fact and you contradict me. I can respond in a common way by inquiring, "Do you mean to call me a liar?" Now, of course, that may not have been your full intention at all. You may merely have considered me misinformed on the matter—which in itself, indeed, might make me mad, too—especially if I pride myself on my superior wealth of information. You may really think I am a liar but your remark did not carry that implication, unless I cared to draw the inference.

A sense of humor is a most vital factor in self-control. The ability to "laugh it off" is an efficient protective device. Humor will relieve the tension even after ire is aroused. An angry division in the British Parliament, which bade fair to end in personal conflicts, ended in shouts of laughter. A bareheaded, redheaded Conservative rose to a point of order. Etiquette required that a member in such a situation must be seated and wearing a hat. A hundred voices pointed out his error, and the questioner borrowed hastily from his neighbor a silk hat many sizes too small and put it on his head. The sight of the silk "topper," balanced precariously, was too much for the dignity of the House. The members burst into roars of laughter, the questioner never succeeded in raising his point of order, and the House adjourned shortly afterward without further incident.¹

¹The Boston *Herald*, June 11, 1931.

It is interesting, in connection with the control of anger on the stimulus side, to study the role of propaganda in the promotion of modern warfare. The fact that propaganda is so necessary to arouse the citizens to a pitch where they will be not only willing but eager to slaughter fellow beings, is an indication that we are not fundamentally as warlike as we are supposed to be. That the fighting instinct is not primarily responsible for war between nations is indicated by the fact that the fears and hatreds of the masses have to be stimulated artificially before they will go to war. Propaganda of falsehood and distortion is indispensable to the waging of modern war. In addition, governments must resort to conscription. Voluntary enlistment failed to produce the required number of soldiers in all belligerent countries during the recent war.

Whereas cities and states live in peace with one another, nations frequently go to war. The explanation of the difference is to be found in the dogmas and emotions of nationalism. It may not be possible to make radical changes in human nature, but it is possible to transform the doctrines of national interest, national sovereignty, national honor, and national patriotism, and to bring them into conformity with the economic and political realities of the modern world.

It is plain that in the past very little sincere effort has been made to educate for peace. History has been taught in terms of wars. Generals have been the chief persons glorified. Patriotism has been conceived in terms of "bearing arms" and of military service. Dr. Rugg of Columbia is making a noteworthy contribution to education, in a series of textbooks the design of which is to condition the minds of school children of a whole nation to tolerance, peace, and understanding of the world's peoples and problems. Emphasis is placed on an economic and industrial interpretation of the world in place

of the age-old story of strife and bloodshed. Wars are given brief mention. The story of the World War is told in five pages, and then not in terms of battles, but in terms of organization of resources, of tremendous costs, and wholesale loss of life. It will be by means of such efforts that peace will be secured, and not by increased armament.¹

Anger may also be controlled on the side of the response. It may be curbed by a direct method or by a change of outlet.

A direct means for restraining the temper is to count ten before you strike your victim—and then, if you must, count ten over him afterward.

A shift of outlet is known as *displacement*. Instead of swearing at his wife, a man may go out and chop up the woodpile. Since violent rage is taboo in polite society, more acceptable forms of expression must be found, such as venting one's anger through making more money than one's adversary, and then gloating over his inferiority. Anger can be put to work for constructive ends.²

An understanding of emotional displacement is very helpful in the process of personal adjustment. The cartoons of the man who starts the day wrong when his toast burns at breakfast, and who then "takes it out" on the stenographer illustrate the point. It is important to realize that a particular misdemeanor may merely offer the occasion rather than the sole provocation for an emotional outburst. A series of annoying mishaps may accumulate a charge of anger which needs only to be ignited to reach the explosive stage. When his wife has had a trying day at home, with the baby sick and the department store sending out the wrong dress, a man comes home from work and forgets to wipe his shoes on the door mat.

¹*The Rugg Social-Science Course*. Edited by Harold Rugg. 1930.

²R. F. Richardson: *The Psychology and Pedagogy of Anger*. 1918.

His wife may "go up in the air" and repent that she ever married such a careless man who doesn't care how much work he makes for her. He should not take her complaints too seriously. He should offer himself as the scapegoat upon whom she can lay her accumulated wrath. An understanding of this bit of psychology would aid in the avoidance of the ill feeling which is often nourished by trivial grievances. The only danger in my advice is that the "innocent" husband may fail to assume the responsibility for faults of his own which may legitimately provoke an outburst of considerable proportions. It must be clearly understood that this situation of husband and wife is reversible.

Displacement, too, offers a valuable solution for war on a larger scale, the conflicts of nations. William James suggested that there were moral equivalents for war.¹ Fighting moral and social evils is one outlet. Through the newspapers, pugnacious citizens may take part vicariously in the chase, prosecution, and punishment of criminals. That righteous indignation may be satisfied through battling the liquor traffic is obvious in this letter written to the *Literary Digest* by a doctor who was disturbed by a news report of the prevalence of drinking among college undergraduates. He calls for a revival of the dry fighting spirit in these terms:

Is there a remnant left in this country who stand for righteousness and honor?

If so, let us rally as did Joffre's men at the Banks of the Marne, and declare again as they did on that immortal day, "They shall not pass."

This is a matter greater than even Prohibition enforcement. It is a question of maintaining the foundations of our American institutions.

I wish that every man and woman in the United States who

¹William James: *Memories and Studies*. 1917.

believes in the enforcement of the Prohibition Law would wear some insignia—to encourage each other.

I have faith to believe that we shall yet rally and drive the forces of evil back to the Hindenburg line.¹

Another moral equivalent is to combat the forces of nature. Have you ever pushed a boulder up an incline? When you succeed in reaching your destination and get the better of the thing, you derive the same sort of satisfaction as comes to the engineer who builds a great canal against heavy obstacles, or to the chemist who wars on disease germs, or to the doctor who conquers a tropical fever.

Another equivalent, amusing in its paradoxical nature, is arguing about war. No discussion can be carried on with more feeling than a debate on war between belligerent pacifists. Ford's "Peace Ship" enjoyed a voyage bellicose enough to release considerable tension.

The realm of sport is another substitute for war, providing an excellent vent for pugnacity among both the players and the spectators. Indeed, prize fighting used to be called "the manly art of modified murder" by the noted sports writer, W. O. McGeehan.

Most important of the equivalents, as far as social values are concerned, is the fight against the forces of evil, whether it be Livingstone fighting slavery in Africa, Lincoln fighting the traffic in America, or Parkhurst fighting political corruption in New York City. The wicked flee when no man pursueth, according to Parkhurst, but they make better time when the righteous are after them. Surely the struggle for a better society provides plenty of opportunity for the expression of human pugnacity without the need of periodic wars to relieve the tension.

E. Self-enhancement. Hunger, love, fear, and anger are generally recognized as basic drives in human motiva-

¹The *Literary Digest*, May 3, 1930.

tion. There are other urges, however, which characterize the human pursuit of happiness. Important among these emotional needs is the desire for self-enhancement.

Every human being wants to achieve some sort of glory to nourish his own ego. We all want to be noticed for some distinction whether it be erudition, a well-groomed appearance, or notorious crime. There is a will-to-power which keeps us everlastingly on the go in search of some unique superiority which will set us apart from the ordinary run of human beings.¹

Vanity comes naturally to us. When the famous dancer, Pavlova, was in Africa, a guide introduced her to a native chieftain as "the greatest dancer in the world." The chief stepped forward, bowed, and politely informed those present, "I beg pardon, but I am the greatest dancer in the world." The chief was amusing because he had the effrontery to voice the sort of conviction each one of us feels in regard to his own worth.

At times, of course, we indulge in self-abasement, but it is only a temporary respite from the pursuit of self-esteem. The reason we are occasionally sensible of our own unworthiness is that we are measuring ourselves against our ideal of what we think we should be. An inferiority complex is merely a symptom of the persistent struggle for superiority. We may suffer the agony of obscurity, but sooner or later we come back like the man who advertised in the column of a Boston newspaper for a large plot of ground in one of the exclusive suburban sections where he proposed to erect a home as an additional ornament to the community. "The person who is anxious for an ideal neighbor without children," said he, "will not

¹See Alfred Adler: *The Neurotic Constitution*. 1921.

This book is a study of the patterns of behavior which characterize the neurotic personality. The neurotic person, for example, is easily hurt by depreciation and his methods of achieving power are of little social value. He attracts attention by means of illness or by daydreaming about doing "big things."

regret making some small concession in price when every other advantage is on his side."

Envy and jealousy are prompted by the urge toward self-enhancement.¹ If we experience discomfort at the success of others, it is because we covet that glory for ourselves. We can respond to the situation by emulating their endeavors, or by minimizing their importance. The easiest way to elevate ourselves is to run down the other fellow.

People who fail to achieve glory in reality sometimes develop delusions of grandeur, mistaking themselves for kings, plutocrats, or other prominent persons. *Megalomania*, an abnormally strong desire for self-glorification, is usually a compensation for feelings of inferiority.

The drive to attract the spotlight is sometimes referred to as the impulse of self-assertion. The will to dominate, to be a big frog even in only a small pond, is a constant spur to aggressive industry. To be important, to maximize the ego, and to occupy high places and associate with only the best people, are desiderata which motivate not only the social climb but self-advancement in general. The will to power prods us to win success by hard work or cunning ingenuity. "The quest of ego-adequacy is the unremitting business of our life."²

Closely allied to the urge for self-enhancement is the acquisitive impulse, for part of the drive for accumulating worldly goods is the craving for the distinction that comes with the possession of more treasures than competitors. We not only want to keep up with the Joneses but we are eager to surpass them. The conspicuous consumption of wealth is a means of impressing upon the less fortunate the fact of superiority.³

¹Envy and jealousy are sometimes called secondary emotions because they are aroused in the pursuit of a primary emotional satisfaction. See W. McDougall: *Introduction to Social Psychology*, pp. 59ff. Second edition, 1909.

²Samuel Schmalhausen: "Family Life," in *The New Generation*, p. 284. 1930.

³T. B. Veblen: *The Theory of the Leisure Class*. 1915.

There is a widespread belief that the desire for profit is the manifestation of an instinct of acquisitiveness, which is presumed to be inherent in human nature. This so-called instinct is often cited as evidence for the superiority of the capitalistic system. It is a spurious argument, however, since there is no inherited tendency for making money. In cultures where coöperation is the ideal and aggressive competition is discouraged, the desire for wealth does not appear.¹ There are several reasons why so many people in our particular culture spend their energies in the pursuit of money. Wealth confers security and it bestows social prestige upon its possessor. The desire for profit turns out, upon closer examination, to be essentially a variant of the urge for self-enhancement. Cultural influences determine in any particular case how an individual will achieve self-esteem and how he will win the respect and approval of his associates.² In America, the "go-getter" who makes a lot of money is glorified; among the Pueblos of New Mexico, the ideal man is modest and retiring and anybody who develops the habit of winning is disbarred from further competition.³ In the latter cultural setting the typical American ambition to amass money is noticeably absent.

III. THE MEASUREMENT OF AFFECTIVITY

The term affectivity is used in a broad sense to include mental states, such as pleasantness and unpleasantness, joy and sorrow, elation and depression, and their emotional concomitants. There are all levels of affectivity from the mildest state of depression to the deepest feeling of despair. Even an isolated spot of color, a curved line, or a single tone may produce a mild affective state, although usually

¹See M. Mead, *et al*: *Coöperation and Competition among Primitive Peoples*. 1937.

²For an excellent account of the cultural influences that affect the individual, see R. Stagner: *Psychology of Personality*, Section 4, "Determinants of Personality." 1937.

³R. Benedict: *Patterns of Culture*, pp. 57-129. 1934.

more complicated and meaningful patterns present themselves as stimuli for human reactions. There are two possible techniques for the study of affectivity: one is investigating an individual's subjective reactions to a stimulus situation in terms of his feelings, and the other is measuring emotional responses by the stimulus situation in terms of the physiological concomitants. The first method is called the *Method of Impression*, and the second, the *Method of Expression*.¹

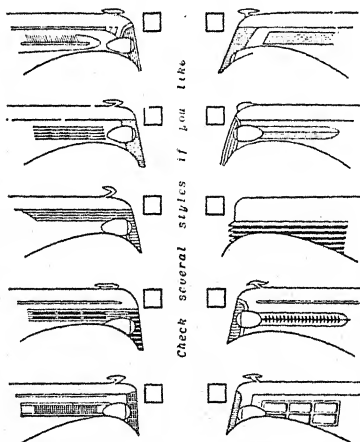
A. Methods of Impression.

The Method of Impression deals principally with one's preference for some objects over others.

HOOD VENTILATORS OR "LOUVERS"

Which of these styles do you prefer?

Check ☒ Answer



ILLUSTRATING THE METHOD OF CHOICE

(Reproduced by permission of the Customer Research Staff, General Motors.)

1. The Order of Merit Method. The Order of Merit Method requires the subject to rank a number of items according to his preference. If we were planning to produce an attractive box for a new breakfast cereal, we would have a number of boxes prepared with different designs and colors, and ask many home owners and housewives to choose the most attractive box, the second best, the third best, etc., down to the least attractive;

then we would use the box design that had the highest average rating.

¹See R. S. Woodworth: *Experimental Psychology*, Chap. 16, "Experimental Aesthetics." 1938.

It is apparent that in this method, as in most other methods of Impression, we can only determine the relative standing of an item. With this technique it is not possible to determine the absolute extent of a person's likes or dislikes, because the results are simply in terms of preference relative to the series under consideration. We determine the preference for an item not by the degree of affectivity aroused by it in a subject, but by the number of instances that the item is given a high rating. The Method of Choice, in which the most preferred item is chosen and the others afterwards disregarded, the Method of Use in which the extent of the use of the object is taken as an index, and the Method of Production, in which the most preferred item is produced by the subject, are so similar to the Order of Merit Method that separate treatment is unwarranted.

In seeking to determine the most pleasing variation of a form or figure, we might ask a number of people to produce their own conceptions on a piece of paper. This would be an example of the Method of Production.

2. The Method of Paired Comparison. In the Method of Paired Comparison each item is compared with every other, and the observer is instructed to choose one of two items with respect to some characteristic. We might use this method to advantage in selecting the most attractive automobile from six models. We would place car no. 1 alongside of car no. 2, then, after judgment was made, place it alongside of nos. 3, 4, 5, and 6. Car no. 2 would be

	1	2	3	4	5
2					
3					
4					
5					
6					

placed alongside of cars no. 3, 4, 5, and 6; car no. 2 was judged in terms of car no. 1 in the first series. The number of judgments necessary is shown by the shaded area of the graph on page 243. It may be determined mathematically by applying the formula $\frac{n(n-1)}{2}$, where n represents

sents the number of items. In our case the formula is:

$$\frac{6(6-1)}{2} \text{ or } \frac{6 \times 5}{2} = 15$$

If the objects being judged are not excessively heavy or bulky, it is advisable to present the pairs in haphazard sequence. The object chosen as the best the greatest number of times will obviously be considered the most preferred.

3. The Method of Single Stimuli. In the Method of Single Stimuli the subject attends to one stimulus only, and either states his opinion in his own words or checks one of a series of categorical descriptions. The categories may be:

- +3. Exceptionally pleasant
- +2. Moderately pleasant
- +1. Slightly pleasant
- 0. Neutral
- 1. Slightly unpleasant
- 2. Moderately unpleasant
- 3. Exceptionally unpleasant

This technique could be employed to advantage in ascertaining the reactions of a sample group of people to various foods, odors, or musical chords. This method is the only one that gives results in terms of an absolute unit. In all the other methods, judgments are made relative to the other objects in the group, but in the Method of Single Stimuli, reference is made directly to inner states of feeling. That the categories may convey slightly different meanings to each individual may be considered a weakness of the method.

B. Methods of Expression. Expression connotes the manifestation of affectivity in the form of physiological activities. These bodily responses are measured with the aid of various instruments, some of which will be described presently. Many of these instruments are used by the medical profession to determine whether or not a bodily process is functioning normally, and to what extent it deviates from the normal.

1. Camera. Photography has proved valuable in the recording of emotional expressions. The man in the picture below has just watched a player on his team miss the



ANGUISHED DISMAY

Joe E. Herkness (grasping his head) felt this way when co-captain Gorge McCown failed to convert following Jay Disston's brilliant 71-yard broken field sprint for a touchdown in the first quarter of the Penn Charter game with Haverford School in Philadelphia.

(By permission of Pictures, Inc.)

kick for the point after a touchdown, a kick that would have meant victory, had it been successful.

The motion picture camera has been especially useful in recording changes in emotional expression. In one experi-

mental situation a pistol is unexpectedly fired and the resulting facial and bodily movements of the subject are recorded by means of slow-motion photography. The sudden overstimulation produced by firing a gun is admittedly adequate to arouse intense emotion. The reactions evoked make up the "startle pattern." In the startle pattern occur muscular responses of a typical sort which express emotional excitement.

The pattern of behavior in the startle response is divided into a primary and a secondary series of movements. The former is of an involuntary, convulsive, avoidant nature and the latter involves more conscious activity of a voluntary, expansive sort. The primary response may range from the element commonly occurring first, namely, blinking of the eyes, through various bodily movements occurring successively in the order of their distance from the head. The secondary response may or may not follow, but when it does, it may take the form of hysterical laughter, and much more extended activity of muscles than that elicited in the primary response. In both human beings and in apes and monkeys, the first series of movements appears to represent protective activity of an involuntary nature, and the second series which often becomes intimately fused with the first suggests strongly a tendency to flee or at least to avoid the overstimulation of the gunshot. Introspective reports indicate that the startle pattern involves fear and anger.¹

2. *Pneumograph*.² The pneumograph is used to measure respiratory or breathing movements. It consists of

¹See C. Landis: "The Interpretation of Facial Expression in Emotion," *Journal of General Psychology*, 1929, 2, 59-72.

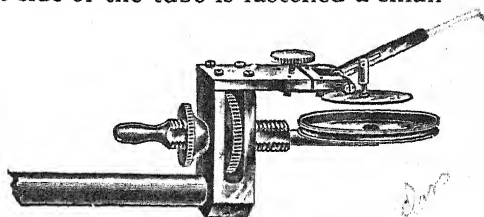
See also C. Landis and W. A. Hunt: "Studies of the Startle Pattern: III. Facial Pattern," *Journal of Psychology*, 1936, 2, 215-220. Also: "Studies of the Startle Pattern": VI. "Temporal Relations," *Journal of Psychology*, 1937, 3, 487-490.

²See C. A. Ruckmick: *The Psychology of Feeling and Emotion*, especially Chapter 10, "Other Experimental Procedures of Expression." 1936.

a rubber tube about an inch in diameter with a loose spring inside. To one side of the tube is fastened a small rubber tube that leads to a recording tambour.

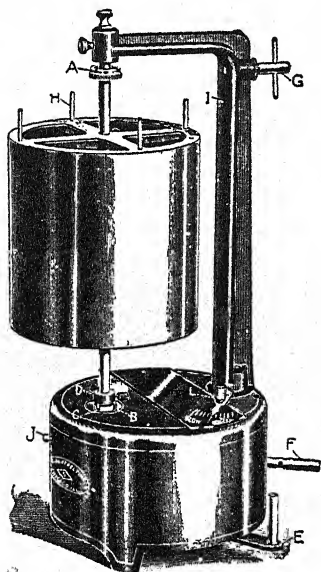
The pneumograph is fastened to the chest or abdomen of the subject by means of a chain that goes around his

back. When the subject inhales, the space inside of the pneumograph is increased, causing a vacuum which pulls the rubber on the recording tambour inward, moving the registering needle or stylus accordingly. A tambour is a rimmed or pan-shaped disc with a thin rubber covering over the open end. A recording stylus is so attached to the center of this rubber sheet that one point of it can record pressure variations on the smoked drum of a kymograph.



RECORDING TAMBOUR

(Reproduced by courtesy of the C. H. Stoelting Company.)



KYMOGRAPH

(Reproduced by courtesy of the C. H. Stoelting Company.)

A kymograph is a motor-driven cylinder of about six inches in diameter and six inches in height, on which smoked paper is placed. When the stylus touches this paper it produces a white line. Waxed paper, together with

an electrically warmed stylus, constitutes a recent improvement in the technique.

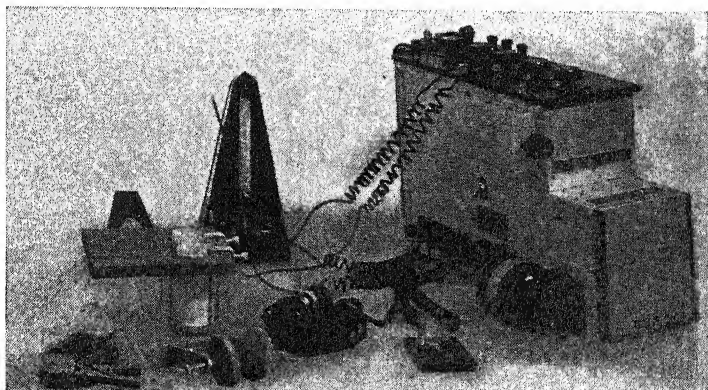
3. Plethysmograph. The plethysmograph is designed to measure the displacement of a particular part of the body submerged in liquid. The forearm or hand, in ordinary practice, is inserted in the chamber which is connected with the tambour that records the variations of displacement due to changes in blood volume. Thus, the activities of the smooth musculature in the veins and arteries are recorded. Care must be taken to exclude irrelevant variables, such as alterations of room temperature and changes in the extent to which the arm or hand is submerged.



RECORDING INVOLUNTARY MUSCLE RESPONSE BY MEANS OF
AN AUTOMATOGRAPH UNDER THE INFLUENCE OF
UNEXPECTED VIOLENT OVERSTIMULATION

The upper plate with recording pen attached moves freely in all directions on the three ball bearings which separate it from the lower stationary plate. The subject is instructed to draw a straight line in very slow tempo from a point on the left to one on the right side of the recording sheet. The tonus of the muscles involved causes fluctuations in the line, the frequency of which is established by a stop watch. A startle pattern induced by the unexpected gun-shot records the upset and attempt to recover control in order to complete the unfinished line drawing.

4. *Automatograph.* The automatograph records involuntary movements of the body. There are various types of instruments adapted for different parts of the body. The automatograph for the arm consists of a flat wooden surface suspended from the ceiling in such a way that movements in all horizontal positions are possible. A pencil attached to the bottom of the board records the movements on a piece of paper. For finger and hand



A PSYCHO GALVANOGRAPH

(Reproduced by courtesy of the C. H. Stoelting Company.)

movements, the subject is instructed to rest his hand or finger on a rubber bulb. A tambour records the movements by pneumatic transmission.

5. *Psychogalvanograph.* Electrodes are attached to the hands of the subject. Changes in skin resistance occur during emotional stress, due to the reflex action of the sweat glands in the skin.¹ These changes are recorded by means of ohms of resistance on a Wheatstone bridge, by means of fluctuations of a luminous indicator on a translucent millimeter scale, and by means of a moving photo-

emotional stress

¹See Ruckmick, *op. cit.*, Chap. II, "The Electrodermal Response."

graphic film. The electrodermal responses thus recorded constitute the psychogalvanic reflex.

6. *Sphygmograph*. The sphygmograph records the form, extent, and frequency of blood pulsations. A receiving drum is fastened over an artery and the variations are transmitted to a recording device.

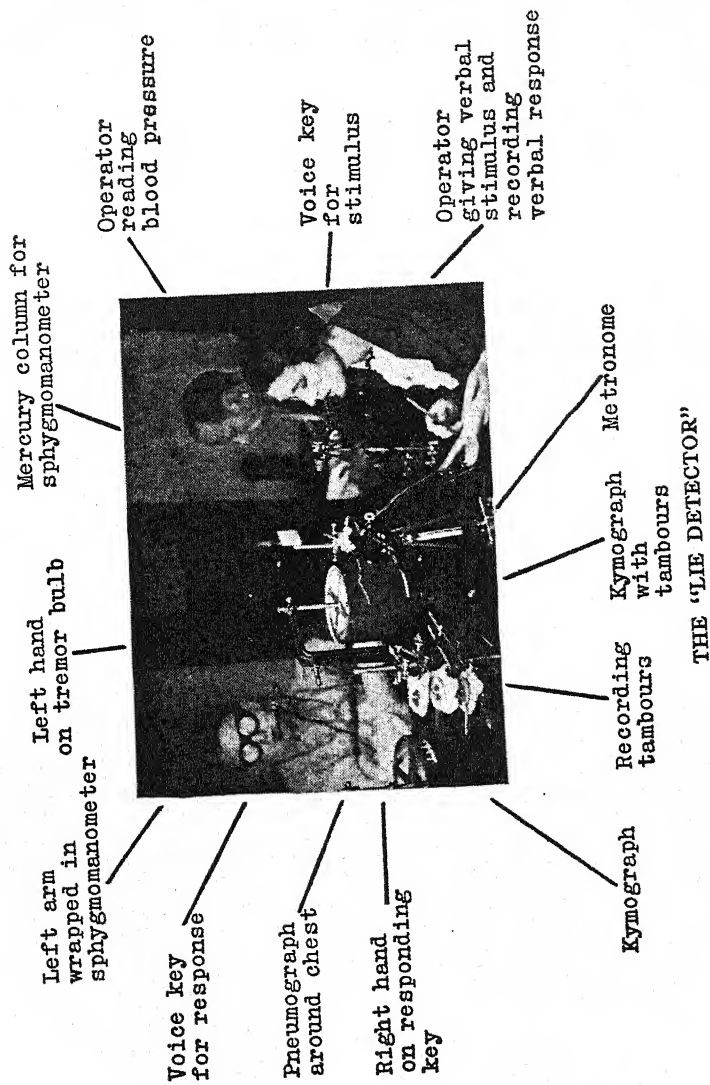
7. *Sphygmomanometer*. The sphygmomanometer is used more frequently by physicians and physiologists than by psychologists. The cuff-sphygmometer (see the photograph entitled the "Lie Detector," page 251), a type of sphygmomanometer, is wound around the arm above the elbow. Air is forced into the sphygmometer until wrist pulsations cease. Blood pressure is determined by air-pressure readings of the sphygmometer at various stages of the recovery of the wrist pulsations.

When a person lies, changes occur in his blood pressure, his pulse, his breathing, and his glandular secretions which may betray his deceit to the expert examiner. Leonarde Keeler tested 500 convicts at the Joliet Penitentiary in Illinois, in 1929, and discovered that blood-pressure and respiration changes during deception were as distinguishable in the hardened criminal as in the virtuous citizen. Even two old-time "poker-face" cardsharps were readily detected.

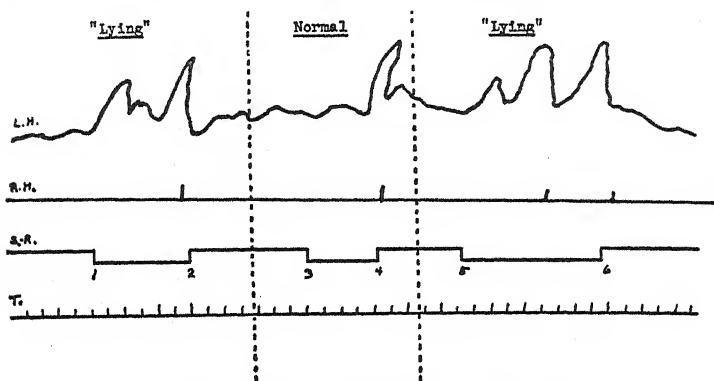
The Northwestern University Scientific Crime Detection Laboratory has aided in the solving of many crimes, ranging from petty larceny to murder.¹ One important phase of the work is the clearing of innocent suspects. In one case, two collection agents were arrested in Black Creek, Wisconsin, on a charge of bank robbery. The defending

¹F. E. Inbau: "Detection of Deception Technique Admitted as Evidence," *The American Journal of Police Science*, incorporated in *The Journal of Criminal Law and Criminology*, July, 1935, 26, No. 2. Also, "The 'Lie-Detector,'" *The Scientific Monthly*, 1935, 40, 81-87.

Leonarde Keeler: "Debunking The 'Lie-Detector,'" *The American Journal of Police Science*, incorporated in *The Journal of Criminal Law and Criminology*, May-June, 1934, 25, No. 1.



lawyer asked to have them examined on the "lie detector." Both suspects submitted to the polygraph examination and a report to the effect that the men were innocent was supplemented by a demonstration before the judge, but he saw fit to rule out the evidence. On the third day, two



SAMPLE RECORD OF LIE DETECTION

Two features of this record which reveal efforts to conceal guilt are the tremors of the left hand (L. H., the top line) and the delay of the verbal response (S-R the line next to the bottom). On the S-R line (1) denotes the presentation of the stimulus and (2) the response; (3) the stimulus, (4) the response; (5) the stimulus and (6) the response. Time is indicated on the bottom line (T). Note that the 1-2 interval and the 5-6 interval are longer than the 3-4 interval. When the stimulus word with "guilty" connections is presented, the subject gets nervous; involuntary movements of the hand betray his tension and the longer reaction time is a "give-away" of an attempt to elude detection by a resort to a misleading response. Further analysis of such a record, including the pressure of a key by the right hand (R. H., the next to the top line), would disclose other significant features we need not mention here.

robbers who confessed to the Black Creek robbery were caught in Minneapolis. When they were brought before the bank employees, they were definitely identified.

Though the polygraph deception test has been used successfully since the early 1920's on thousands of criminal suspects and others, a great deal of research remains to be done. Although its use has been accepted as evidence by some judges in the lower courts, its validity has never been upheld in an appeal. The apparatus is being improved

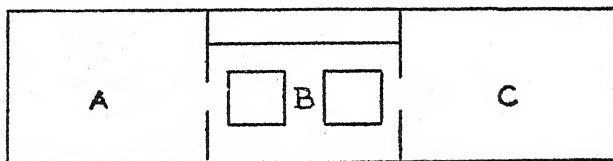
and the technique is being perfected to a high degree of reliability. In the near future some form of deception test based on the recording of bodily changes will probably be added to the fingerprint and radio systems, as a further means of raising the efficiency of our law-enforcing agencies.

IV. MEASUREMENT OF DRIVES

The concept of drive includes the need or desire to respond to a motivating stimulus, and the force and persistence of the resulting activity. Some psychologists treat these two factors individually, defining the first as "motivation," and the second as "action" or "behavior." Since no sharp line of demarcation between them is definable, it seems expedient to employ the concept of "drive" to include both the central and motor processes.

A. Obstruction Method. Considerable tension may be aroused in an animal by depriving him of something he wants badly. The craving may be whetted until there is an intense urge to seek possession of the object desired. The strength of the longing may be determined by interposing measurable obstructions in the path of the search. This method of measurement is called the *obstruction* or *resistance* method.

Any animal drive may be measured in terms of the resistance overcome, provided the strength of the resistance is known; or, where the strength of the drive is known and that of the resistance is not, the resistance may be measured in terms of the drive. . . . If white rats are kept without food for some time and placed in section A of the experiment box, whether they will cross the electric plates in B to go to the food in section



C depends upon two things—how hungry they are and how strong the current is on the electric plates; i.e., upon the strength of the drive as balanced against the strength of the resistance. If the animals have had sufficient contact with the plates before to know what to expect, and if there is sufficient current on the plates, they will not attempt to cross, unless impelled by a very strong hunger drive. This was demonstrated in a series of experiments, keeping the animals without food for from twelve to one hundred and forty-four hours and keeping the current on the plates at twenty-eight volts. Less than 5 per cent of the animals had sufficient hunger drive to overcome the resistance necessary to go to the food at the close of a twenty-four-hour hunger period. The drive increased within the next twelve hours, so that approximately twenty per cent crossed at that time. By forty-eight hours, the drive was sufficiently strong in half the cases to overcome the resistance, and the rats crossed to the food. And by seventy-two hours, the hunger drive overcame the resistance in eighty per cent of the cases. By ninety-six hours, ninety-five per cent of the rats had crossed, and by one hundred and forty-four hours, every rat in the group had crossed. . . .

From the above, it will readily appear that the animals may be induced to cross for the food either by increasing the drive by keeping them without food for a longer time, or by reducing the resistance in the form of the electric current which they have to overcome to get to the food.¹

Barriers intensify motivation, also, in the human sphere. A club which takes in anybody who wants to get in does not find many people eager to join. The restriction of membership, on the other hand, acts as a dynamic barrier which incites people to rush for inclusion. Many proverbs express this principle:

Nothing so good as forbidden fruit.

A fence between makes love more keen.

Absence makes the heart grow fonder.

The grass is always greener on the other side of the fence.

¹F. A. Moss: *Applications of Psychology*, pp. 7-10. 1929. Quoted by permission of and by arrangement with Houghton Mifflin Company.

Wright used the dessert counter of a cafeteria to test the influence of barriers on the strength of motivation. The psychologist arranged that only one kind of dessert was to be sold at this counter. Each helping was just like all the others, and when they had been prepared they were set out in two rows in front of the patrons. The first row was the easier for them to pick up and put on their trays. But the second row was farther away, and difficult to reach due to a glass shelf which stuck out over this row of desserts. This inconvenience of the second row, one might imagine, would make most people take their dessert from the front row. But human nature does not always take the easiest or the shortest route. Although the desserts were all as alike as could be, the people took 50 per cent more desserts from the back, hard-to-get row.¹

B. Topological Method. Another objective approach to the study of drives, in addition to the *obstruction* method, is the *topological* method. Some modern psychologists who want to apply some of the concepts of mathematics and physics to psychology, prefer the topological viewpoint because it may serve to improve the accuracy of experimental description. This method enables the psychologist to measure and describe objectively the changes brought about when an organism responsively adapts itself to a stimulating environment.

Lewin, a German psychologist, is an exponent of the topological method. He finds that his theory affords him a systematic approach to the study of the psychological forces involved when an animal or person is placed in a situation provocative of action. Subjective and objective conditions must be taken into account. Heredity and environment being interdependent, they must both "work

¹H. F. Wright: "The Influence of Barriers upon the Strength of Motivation," *Contributions to Psychological Theory*, Vol. I, No. 3. 1937. Duke University.

in the same direction to effect a certain mode of behavior."¹ The manner in which a person reacts is dependent upon (1) his momentary needs, desires, or subjective set, and (2) the existing environmental situation. One of these factors is meaningless without the other.

Lewin asserts that when the psychologist is studying the reactions of an individual, it is important that no parts of the environmental setting be ignored. A setting must be viewed as a dynamic whole, and not as a sum of unrelated elements. For example, a chocolate bar has a different meaning to a child if it is out of his reach, or if other things more tempting to him are available.

Lewin thinks of behavior in terms of physics, as force applied in a certain direction. A situation is analyzed from a psychological standpoint and then it is reproduced diagrammatically, the forces being indicated by arrows. According to Lewin, a force possesses three significant properties: (1) direction, (2) strength, and (3) point of application. The direction and strength of a force are both subsumed under one concept, that of *vector*, which is represented by an arrow. The length of the arrow is used frequently to designate the strength or intensity of the force. The head of the arrow is directed toward the point of application. The power that an object possesses to attract or repel the subject is called *valence*, and an object is said to have positive (+) or negative (—) valence. Figures 1 and 2 represent positive and negative valence respectively:

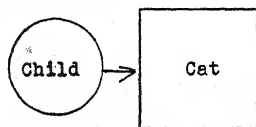


Fig. 1. Positive Valence

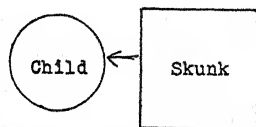
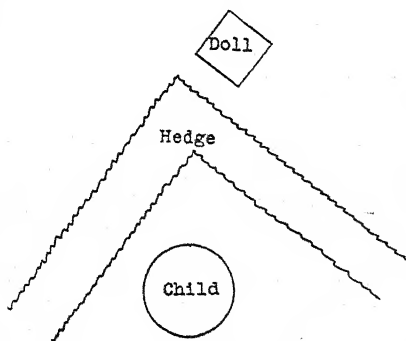


Fig. 2. Negative Valence

¹K. Lewin: *A Dynamic Theory of Personality*. 1935. See also K. Lewin: "Environmental Forces," Chap. 14, in *A Handbook of Child Psychology*, C. Murchison, Editor. Second edition, revised, 1933.

There are forces not resident in the object under consideration which frequently enhance, depreciate, or completely determine the value of an object as a stimulus. One of these forces has to do with the needs of the individual himself. These needs may be the result of a disequilibrium of the subject's physical structure, such as a need for food, liquid, sleep, or sex satisfaction; or the needs may be the result of psychological urges such as the desire to be successful, or the wish to obtain wealth. There may be still other forces which result from barriers that frustrate or impede the progress of the individual in some way. A barrier is a physical or psychological boundary which limits the activity of the person concerned. In the case of a child it may be a fence, wall, or door. Such boundaries define the amount of space available for the child. Social forces are also usually operative. These are the commands and prohibitions imposed by the group. As a child grows older he becomes increasingly aware of these restrictions. Many social demands, of course, become so much a part of the individual as to function automatically.

Lewin brings out the importance of direction in his *detour problems*, in which a child must first move away from a desired object before he can attain it. Sup-



pose a child is separated from a doll by a hedge over which he cannot climb. In order to obtain the doll he must execute a movement at variance with the direction of the force. Lewin demonstrates the importance of direction by explaining that an increase of the valence makes it harder

rather than easier to move in a direction opposite to that of the force.

From this same topological viewpoint, a conflict is described as an opposition of approximately equal forces. There are three principal types of conflict: (1) When an individual is confronted with two positive valences, (2) when he is subjected to an object possessing both positive and negative valences, (3) when two negative valences are operating.

In Figure 3, the child has a choice of either the theater or the seashore. Both appeal to him and he must sacrifice

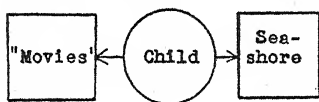


Fig. 3. A conflict between two positive valences

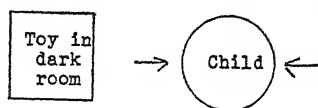


Fig. 4. A conflict caused by the presence of both positive and negative valences.

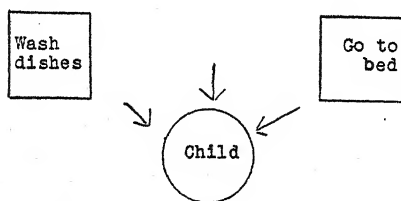


Fig. 5. A conflict between two negative valences.

one for the other. This kind of decision is comparatively easy because in either case pleasantness is the final result. In Figure 4, a child wants a toy that is in a dark room. If the child dislikes dark rooms the room offers positive (the toy) and negative valences. In Figure 5, the child has been placed between two negative valences, washing the dishes or going to bed. The vertical arrow delineates a force acting to remove the child from the entire situation.

Lewin's method of defining psychological processes in terms of mathematics and diagrams is commendable in that it offers a definite and clear exposition of the behavior of an individual under certain conditions. However, as settings become cumbersome and complicated, diagrams take on a resulting vagueness and complicatedness, and it becomes obvious that a multi-dimensional system cannot be reproduced in diagrams restricted to two dimensions.¹

For purposes of measurement it is convenient to consider drives in terms of behavior alone. We must not lose sight of the fact, however, that the behavior we are observing is merely an outward manifestation of a dynamically integrated subjective process. The subjective process can be studied indirectly by the methods of expression already mentioned, or directly by introspection.

SUMMARY

The behavior of the newly born child is non-specific except for adient and abient tendencies of a general nature. More complicated and discriminating emotional patterns evolve as the individual grows in experience. Visceral reactions play a role in the emotions, as the James-Lange theory asserted, though experimental investigation has shown the center of emotional activity lies in the hypothalamus. These tensions involved in emotions operate as motives, providing a person with an important source of power. It is likely that certain emotions will predominate in an individual in accordance with his temperament and his prevailing moods. Study of this field of motivation convinces the careful observer that behavior can only be understood in terms of the goals pursued.

Basic urges are hunger, love, fear, anger, and self-enhancement. These urges represent typical human in-

¹K. Lewin: *Principles of Topological Psychology*. 1936.

terests developed under the influences of the particular culture in which the individual is reared.

Affectivity—including the feelings and the emotions—may be measured by the Methods of Impression: Order of Merit, Paired Comparison, and Single Stimuli; and by the Methods of Expression: employing the camera, pneumograph, plethysmograph, automatograph, psychogalvanograph, sphygmograph, and sphygmomanometer.

The strength and direction of drives may be measured by the Obstruction Method and the Topological Method.

MENTAL CONFLICT

THE VARIOUS URGES often impel the individual to engage in incompatible activities, thus giving rise to a state of conflict. The exact nature of this conflict is unrecognized when the motivation is unconscious, as is so frequently the case. Under such circumstances a person is unable to understand the meaning of his own behavior or to fathom the underlying reasons for his unhappiness.

From the foregoing we can realize that although psychology is primarily concerned with the activities that constitute our conscious experience, experience cannot be adequately understood until we probe into the tendencies that determine our mental reactions. We must comprehend the glandular basis of our moods, until we uncover those habitual dispositions which have dropped from our notice through long practice, and unearth those primitive longings for brutality and lust that usually elude awareness. The experience we know is determined to a large extent by factors ordinarily outside awareness.¹ We must investigate this dim background, "the hidden recesses of the mind," to appreciate the significance of the fact that we are often motivated in our thoughts and actions by trends in our nature which remain, often discreetly, *incognito*. There are some persons who feel that our self-respect must inevitably suffer if we get to know our "real"

¹See E. V. Stonequist: *The Marginal Man: a Study in Personality and Culture Conflict*. 1937.

selves too well, but we should steel ourselves to the truth, for even though it turn out that we are worse than we ever suspected, we may also find that we are better than we ever dreamed.

I. UNCONSCIOUS BEHAVIOR

While it is true that man is a thinking animal, many of his adjustments are worked out without much conscious reflection; such is the case particularly when factors either in the environment or within the mind involve elements repugnant to the personality. Behavior is often unconscious because peace of mind is better preserved if the motives remain unknown.

A. The Ego Ideal. Each of us sets up for himself an ideal which represents that pattern of life which will sustain self-respect and merit social approval, and this goal for self-realization we may designate as the ego ideal. The individual comes to measure himself against the ideal as a standard, and since human nature is beset with diverse tendencies some of which do not fit handily into the picture of respectability, he is forced to realize, only too often, that he falls short of his high aims. In order to maintain his self-respect and the admiration of his fellows, the individual must resort to devices which will serve to conceal his motives from the scrutiny of his own conscience and the censure of his associates. Thus it happens that subtle adaptations are effected which escape even his own detection.

B. Defense Mechanisms. Modern psychology has revealed the fact that many adjustments proceed outside the awareness of the individual. Indeed, such adaptations as constitute defense mechanisms—mechanisms, that is, which defend the ego against depreciation—must escape the light of consciousness if they are to succeed in fulfilling their purposes. These mechanisms, so-called, are modes

of behavior resorted to as a way out of the distress engendered by conflict. There is no doubt that the human being is often unconscious of the motivation and meaning of his behavior. Problems which are vital to the personality are solved by devious means which ordinarily elude detection. The solutions are frequently compromises which merely postpone the day of reckoning, providing a temporary peace of mind. Since the function of consciousness is to promote efficient adaptation, it is the part of wisdom to examine the means by which the mind succeeds in fooling itself, and to substitute for unthinking adjustments ones in which the value of thinking can be adequately capitalized.

1. Evidence from Abnormal Psychology. Evidence of the importance of mental mechanisms which function in a subtle manner is supplied by a study of the abnormal mind in which the normal person can see his own foibles in the spotlight of exaggeration. The lunatic is only a caricature of the normal person. It is said that the wise man and the fool seem much alike when they fall in love or try to explain hard times. We are all irrational. In view of our follies, it is really astonishing that we seem as rational to ourselves as we sometimes do.

Psychiatry, the study of mental diseases, has shed considerable light upon the workings of the abnormal mind, findings which are equally applicable in their fundamentals to the normal mind. *Psychoanalysis*, which is a special technique for the diagnosis and treatment of the psychopathological individual, has been especially fruitful in extending the range of psychological understanding, bringing into bold relief the psychology of illness.

Some illnesses under some circumstances, psychoanalysis points out, afford peculiar satisfactions which may be denied in health. For the sick child, there is a relaxation of parental discipline. Everyone likes to be

pampered. An ill child can in a day be spoiled beyond weeks of redemption. The solicitude of friends is gratifying to one who enjoys being the center of attention. To have undergone an unusual operation is to win notice and distinction provided one has an opportunity to talk enough about it.

Unfortunate health habits are established whenever a person makes his sickness an occasion for some special dispensation, such as a trip to Bermuda, an indulgence foregone during times of well-being for reasons of economy. Neurotic individuals cultivate illness unconsciously to gain pleasurable ends, to win sympathy, to secure special consideration, to afford an excuse for some failure.¹ Strangely enough such persons want to be ill, though they would never admit it to others or to themselves.

A large part of the material of this chapter would not be available, were it not for the discoveries of Sigmund Freud, the founder of psychoanalysis. Credit should also be given to Bernard Hart, who in his *Psychology of Insanity* simplified the Freudian concepts and emphasized anew their applicability to the normal mind.

2. Evidence from Mental Hygiene. On March 28, 1841, Dorothea Lynde Dix undertook to give Sunday-school instruction to the female inmates of the East Cambridge House of Correction, in Cambridge, Massachusetts. There she was brought into contact, for the first time, with the deplorable conditions existing in the penal institutions of those days. She found twenty women, among whom several were insane, crowded together in one room in which no provision was made for either bedding or heat. Shocked and outraged at the conditions she encountered, Miss Dix determined to establish asylums for the care of

¹A neurotic is an individual suffering from a minor nervous disorder, or as somebody has facetiously put it, a person who thinks you mean it when you ask him how he is.

the insane. Single-handed, frail in health, but with indomitable energy and firm moral purpose, she succeeded in a few years in securing the establishment of no less than thirty-two public and private institutions for the insane. Through her efforts the way was prepared for the origination of the Mental Hygiene movement which came into being twenty-one years after her death.

In 1900 Clifford Beers of New Haven "lost his mind" and entered upon a period of confinement in various hospitals and asylums where he was subjected to brutal treatment of a most inhuman sort. He vowed, if he ever regained his sanity, to write a book describing his experiences, in the hope that the public would be stirred to reform the institutional care of the insane. Fortunately, Beers' hope was realized. Encouraged by William James, who read his manuscript and urged him to publish it, Beers issued his story, *A Mind That Found Itself*, in 1908. The book attracted widespread attention.

With the coöperation of friends, Beers founded the Connecticut Society for Mental Hygiene in 1908. In 1909 the National Committee for Mental Hygiene was established. The movement has since grown into an international organization.

The original purpose of the Mental Hygiene movement was to take measures for humanizing the care of the insane. As the work progressed, it became apparent that the prevention of insanity was equally as vital as the cure. It was natural, therefore, that mental hygiene should branch out to include normal people, pointing the way to the means of achieving that efficiency and that happiness which insure the healthy mind against the dangers of breakdown.¹ During the last twenty-four years the literature of mental hygiene has grown rapidly.

The material of this chapter is typical of the approach

¹See E. M. Smithies: *Case Studies of Normal Adolescent Girls*. 1933.

to mental life taken by the mental hygienists, whose main concern is to stimulate an interest in those problems of emotional adjustment which are of vital import in the attainment of happiness.

II. CONFLICT

One of the most obvious aspects of human nature is inconsistency, especially as we see it exhibited in the conduct of others rather than in ourselves. A prominent banker, in his report for 1930 as chairman of the bank's governing board, recommended industrial pay reductions at about the same time his own salary was being increased from \$218,000 to \$250,000 yearly. George Bernard Shaw and H. L. Mencken both attacked marriage as an ignominious capitulation, and then yielded in shameful surrender, themselves. Alfred Nobel made a fortune in the manufacture of explosives, producing the most destructive forces that ever ravaged mankind, and then, at his death, devoted his wealth to rewarding the promoters of peace among nations and the benefactors of humanity in literature and science. It is small wonder that the minds of ordinary mortals are beset with confusion.

In behavioristic terms, conflict results from the evocation of incompatible reaction tendencies, either instinctive or learned. Dogs have been trained to react differentially to two figures such as an ellipse and a circle. If the ellipse is gradually altered until it nears the form of the circle, the dogs become so confused that they grow restless and start to howl.¹ Experiments involving the same principle have been performed with pigs and other animals with the same results.²

¹See Ivan Pavlov: *Lectures on Conditioned Reflexes*, Chap. 36, "Relation between Excitation, and Inhibition and Their Delimitations: Experimental Neuroses in Dogs." 1928.

²H. S. Liddell: "Comparative Physiology of the Conditioned Motor Reflex Based on Experiments with the Pig, Dog, Sheep, Goat, and Rabbit," *Comparative Psychology Monograph*, 1934, Vol. 11, No. 1, Serial No. 51.

Watson has shown that a person may be rendered psychopathological by building in conflicting habits.¹ Butler, too, points out that warring habits often result from misdirected habit training. He urges parents who inculcate ambition in their children also to instill habits of industry. Otherwise, the desire to get ahead in the world will clash with the tendency to "take things easy," and unhappiness will ensue.²

Reference has been made in Chapter 6 to the experiments of Lewin, a *Gestalt* psychologist, who places children in situations where conflict is generated. A toy in a dark room, for example, involves a positive valence and a negative valence. These reaction tendencies are obviously incompatible.

Luria has devised some ingenious techniques for studying mental conflict in his investigations at the State Institute of Experimental Psychology in Moscow. Conflict is experimentally induced by various means. One method is to establish a set toward success in the subject by giving him some problems which he can solve, and then presenting a problem which is incapable of solution. Conflict results when the set toward success meets an unsurpassable obstruction. Luria also induces conflict by suggesting during hypnosis two equally obligatory and opposed tendencies, for example, a plea to a medical student to perform an abortion and a warning not to go through with it. Affective reactions of restlessness and distress in the subject indicate the presence of an acute conflict.³

Experiments were arranged for observing the manner

¹J. B. Watson: *Behaviorism*, pp. 295-300. Revised edition, 1930.

²J. R. Butler: *Human Nature: A Guide to Its Understanding*, Chap. 6, "Warring Habits." 1933. See E. R. Guthrie: *The Psychology of Human Conflict*. 1938.

³A. R. Luria: *The Nature of Human Conflicts; or Emotion, Conflict, and Will: An Objective Study of Disorganization and Control of Human Behaviour*, pp. 132-133; also Part II, "Psychophysiology of the Conflicting Processes." 1932.

in which human behavior becomes confused under the stress of intense emotion. Tests were given to students who were about to face the "cleansing" examination determining their fitness for the higher communistic education, and to criminals who had just been arrested for crimes ranging from petty larceny to murder.

Luria takes as an index of confusion (disorganization) the inability of the subject to coordinate his verbal and kinesthetic behavior when a word connected with the critical situation serves to stir him up emotionally. The subject becomes "rattled" or confused. The cortex is so disorganized by the tense emotion that its inhibitory control over the motor reactions is diminished temporarily.

In one experimental set-up, the subject is seated in a comfortable armchair in front of a table. The right hand lies on the table with the fingers resting on a pneumatic bulb, while the left hand rests passively upon a weight. An electrical key closed by the experimenter registers the moment of stimulation, while a sensitive membrane operated by the subject's voice registers the moment of response. The record is made on a kymographic drum. The subject is instructed to press the pneumatic bulb with his right hand simultaneously with his speech response. The ascent of the curve on the drum represents the pressure of the fingers on the bulb while the descent of the curve represents a decrease of pressure. Involuntary tremors of the left hand due to the excitement (neurodynamic excitation) are also recorded. The combined language and motor reactions constitute a unified motor structure the parts of which must be interpreted with reference to the whole. When a complex is "touched" by the stimulus word, the subject tends to respond with the first word occurring to his mind.¹ This word being

¹The test is a Free Association Test. See pp. 459-461 for a more complete account of this type of test.

a "guilty" one, the subject inhibits the verbal response while he thinks up an "innocent" word to conceal his state of perturbation (affective traces). Meanwhile, however, he has proceeded to press the bulb at the moment when the first or "guilty" word came to him and his motor reaction is a "give-away" of the inhibition and conflict transpiring on the "inside." Due to the set to press the bulb when he gives his verbal response, the subject involuntarily imparts the pressure with his fingers when the initial tendency to speak is experienced. The response word is suppressed but the pressure is registered nevertheless, in a subdued and irregular form. According to Luria the affect upsets the inhibitory functions of the cortex and the unobstructed excitation begins to flow into the motor sphere, distorting and disorganizing the behavior.¹ Control subjects (non-criminals) are used to obtain normal reaction patterns, or reaction formulæ as Luria prefers to call them. The normal patterns are regular, whereas the formulæ observed in criminals under the test conditions are chaotic. Let us consider a sample case.

On the 15th of January, 1926, a body of an unknown man was found in a pile of snow, in a courtyard of a house. The body was lying on its back, in underclothes, with the *valenka* (Russian felt boots) beside it. The head had been split by a heavy instrument, on the body were stab wounds, and the whole body was dirty with coal dust. Tracks in the snow led to a blacksmith shop, and there the instrument of the murder was found—a sledge-hammer bespattered with blood, and the remains of a charred, bloody shirt.

The owner of the blacksmith shop, Sm., 30 years old, was suspected. The murdered man was the porter from a neighboring house, and he and Sm. often drank together. It was found that the day before the murder they were seen together, drink-

¹C. W. Darrow: "Emotion as Relative Functional Decortication: The Role of Conflict," *Psychological Review*, 1935, 42, 566-578.

ing in a saloon. The preliminary investigation showed that on the morning of the 15th of January, Sm. went to his blacksmith shop by an unusual way which led through the court where the body lay, but by a roundabout path. After arriving there, he then went to church, which was not his custom, and remained some time. It was also brought out that during the night of the 15th of January he was at home and did not sleep, but smoked a great deal.

On being arrested, he denied any participation in the murder. Our experiment was done the 16th of January, 1926, *i.e.*, one day after the crime. Among the 70 word stimuli there were fourteen which had a direct relation to the situation of the crime: porter, quarrel, money, boots, hammer, blow, spot, shirt, body, knife, to cut, to drag, tracks, and blood. The following record reveals the reactions to some of these words:

- 6. Normal reaction: Hay—1.8"—wood (one and $\frac{8}{10}$ seconds)
- 51. Knife—2.8"—to cut bread
- 54. Drunk—5.6"—fool
- 55. To crawl—3.2"—to sleep
- 61. Tracks—3.5"—wood
- 71. Blood—3.8"—death
- 21. Money—3.4"—to live
- 35. Hammer—3.8"—to carry

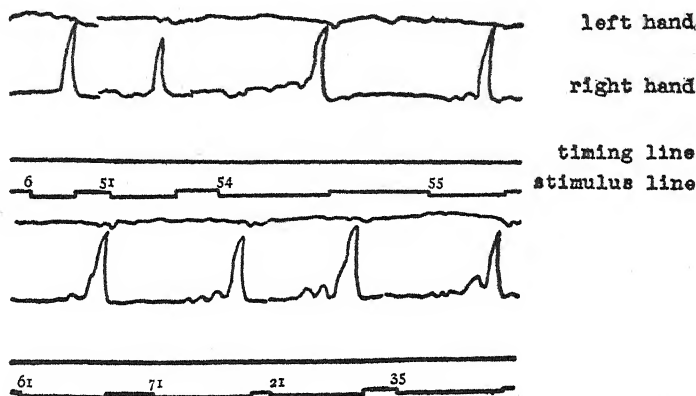
Notice that the first pressure of the right hand is regular, as the stimulus word does not touch the complex. The pressures in response to the key words are irregular. (See next page.)

Sm. confessed his guilt.

Here is the picture of this crime: on the 14th of January, Sm. and his friend, the janitor, were in the saloon, and upon leaving they started to the blacksmith shop, intending to empty another bottle there. When they had arrived Sm. asked his friend whether he was going to pay him the two-ruble debt which he owed. When this was answered in the negative, Sm. grabbed the hammer and struck him on the head. The wounded man fell and began to groan and crawl on the floor. Sm. became very frightened, and, according to his story, he grew sorry for the struggling man and finished killing him with a knife; after this he removed the outside clothing which was spattered with blood, burned it, and buried the body in the courtyard, where it remained.

After giving this history of the crime, the disturbances coinciding with such stimuli as money, blow, knife, hammer, drunk, to crawl, tracks, quarrel, etc., are easily understood.

The full meaning of the records obtained by Luria can only be disclosed by a careful study of all the factors in the reaction formulæ characterizing different kinds of persons under varied experimental conditions.¹



SUBJECT, "SM." (MURDERER)

The ambivalence of human impulse affords some insight into the nature of mental conflict. Ambivalence means the simultaneous existence of contrary emotions towards the same person. The object has a positive and a negative valence at the same time. Hatred, strangely, seems to be a natural component of love. It is possible, even natural, assert the psychoanalysts, to love and to hate the same person, particularly if the affection is unrequited. One woman told her husband that if there were not something within her that told her she loved him, she would be sure

¹Luria, *op. cit.*, pp. 102-106. By permission of Liveright Publishing Corporation.

she hated him. Certainly, thwarted love often turns to hatred, and perhaps the ease of the transition from the one emotion to its opposite is explicable in terms of the fact that hatred is inherent in love.

The inconsistencies of conduct indicate that personality is a manifold, complex affair, in which diversity is even more apparent than unity. The individual is made up of numerous selves, displaying one self in the home, another in the office, and still another on the golf course. Frequently these selves conflict with each other, as may happen when the undergraduate away at college engages in dissipations scrupulously avoided at home. There are many different conflicting situations to which a person must adapt himself, depending in part on the complexity of the cultural patterns which are inculcated in him during his early years.¹ The moral codes of his own generation may condone conduct of which his parents, his grandparents, or his parents-in-law vigorously disapprove. Since he is sensitive to the opinions of all the several persons with whom he associates, and since he craves the esteem of each and every one he cares about, it is clear that, in the effort to please them all, conflicts are inevitably generated. To assert that an individual has many selves is simply to state that he has many interests in life. The different inclinations of the human being, because of their variety, may never be adequately systematized to produce a unified personality.

The fundamental conflict involves the adjustment of impulse to the demands of conscience.² Ideas of right and wrong are inculcated by approval and disapproval. A code of conduct is thus developed, which, however it may differ among individuals, constitutes a categorical im-

¹See K. Horney: *The Neurotic Personality of Our Time*. 1937.

²Conscience is the system of values with reference to which judgments of right or wrong are determined.

perative. The violation of this imperative brings a sense of guilt with its attendant discomfort.

Since mental conflict produces a state of restless dissatisfaction, a drive is engendered toward resolving the stress in order to gain peace of mind. The so-called "mental mechanisms" which we are about to describe are different habits for the resolution of conflict. In contrast to some of our problems which are attacked by thinking, the way out of emotional strife is often traversed in an unthinking, unconscious fashion, so that the individual concerned may be at a loss to account for his own behavior until he has resorted to considerable reflection, and even then, the very subtlety of his adjustments may prompt him to a misinterpretation.

III. THE RESOLUTION OF CONFLICT

A. Repression. Suppose two rough urchins fight every day on the way home from school, much to the chagrin of a dignified woman who witnesses their combat from the window of her home. In her distress, she will seek to prevent them from fighting. She may rush out and restrain one of the combatants by force—the process would be called repression; she may instruct the teachers to send them home over different routes so that they do not confront each other—that would be dissociation; or she may put whiskers on one or both of them so that they do not recognize each other when they do meet—that would be rationalization, or displacement, or one of the other deceptive mechanisms.

Repression is the process by which an element in the conflict is forcefully ejected from the conscious arena. In times of depression, when it is unpleasant to contemplate the consequences of disastrous investments, it is a relief to dismiss the stock market from the mind, to refrain from thinking about it, to skip the financial page of the daily

newspaper, to avoid friends who insist on brooding over declining quotations, and to turn a deaf ear to comrades who have a wonderful tip.

It is not always simple to succeed in repression. Inhibition of desire sometimes only serves to whet the appetite. Trying too hard to forget may defeat its own end. Thinking continually "I won't smoke" may suggest anew the delights of tobacco.

While repression may afford a temporary relief, its results are ultimately unwholesome. Banishing the forbidden desire relegates it to a region outside conscious control. In the recesses of the shadows, it can work havoc unnoticed. Just as prohibitions may produce the bootlegger, so repression may cause the mental outlaw to work under cover. It would be far better to hale the criminal wish into the mental court where it can be regulated with intelligent justice. It is the part of wisdom to keep our tabooed urges in the open so that we can follow them and keep them under control. It is far better to think over our plans and relate them to our values, so that we may keep ourselves organized for self-discipline when the need may arise. Repression, because it is an unthinking form of adjustment, has a disintegrating effect on the personality.

Repression is, in a large measure, responsible for the success of the disguises under which many adjustments take place. Driven under cover by repression, desires operate in ways unknown to the personality. The repressing forces of conscience encourage subtlety—and thus prepare the way for unthinking behavior.

B. Dissociation. Dissociation is another means of resolving a conflict. The combatants are not allowed to get at each other at all.

A common form of dissociation is the logic-tight compartment. If a person has a pet theory, upsetting evi-

dence is ruled out of order. Our political convictions are notoriously inaccessible to argument. It is of no avail to try to convince a person that his candidate suffers from serious deficiencies. One might as well try to tip over the Rock of Gibraltar as to seek to persuade a loyal New Englander that the schedule of the protective tariff should be more concerned with the interests of the Western farmer, or to lead a Southern Democrat to believe that the Republican party is responsible for the preëminence of the United States in the modern world. Logic cannot "crash the gate" where it is not wanted.

Science and religion are often kept in separate enclosures. The hard-headed scientist may accept the incredible on faith when his soul is at stake. Swedenborg was a renowned scientist until, at the age of fifty-seven, he heard a call from the glory world, and devoted the rest of his days to fellowship with the angels, finally concluding that the "sciences contribute nothing to salvation, but rather confuse and distort ideas."¹

In Swedenborg's case, the dissociation was chronologically successive. It is possible, however, for a person to keep both science and religion alive simultaneously, with no effect exerted by one on the other. Religious teachings are often divorced from the practices of weekday life. The practical businessman who is accustomed to dealing with "hard facts" in the commercial sphere may seek in religion spiritual rest rather than cerebral exercise, and, consequently, he is apt to approach religious matters with an ingenuous naïveté which would spell ruin for him in his business transactions.

Dissociation is a very natural phenomenon. We all get dissociated, more or less, except those people who cannot go to pieces because they never get assembled. The girl

¹C. W. Ferguson: *The Confusion of Tongues*, Chap. 16, "Swedenborgianism." 1929.

who goes about stockingless, with a fur neckpiece added to her summer ensemble, is unorganized. The person who weeps over the plight of the hero on the stage, although he knows the drama is just a play, is dissociated. The individual who forgets a name has disintegrated. Most people go to pieces only under stress, though others need less provocation.

C. Compensation. Compensation is a defense mechanism by which the individual, to guard against one extreme, goes to the other extreme. A person leans over backward to prevent falling forward. Just as the stock market goes too high when it rises and too low when it sinks, with respect to sound values, so the individual swings from one extreme to the other in seeking to maintain his psychic equilibrium. Excessive behavior is very apt to be defensive tactics of a compensatory nature. Many a high hat covers a low brow.

A troubled wife beseeches counsel:

My husband shows in every way his devotion and admiration for me and for our two lovely children whom he adores. But now and then some fair one appears and her forced attentions flatter his ego until he finds himself taking part in a small-sized affair. I always sense it, for at such times he is doubly nice to us, and I know this is not to deceive me, but because at heart he is truly ashamed of what he is doing.

Her insight probably is correct. Her husband's doubled devotion is unconsciously motivated. He may be unaware of the significance of his conduct.

Religious dogmatism is often a compensation for harassing doubts. Fanaticism in one direction is an effort to defeat strong inclinations in the opposite direction. Prudery is all too many times not a sign of purity, but a revelation of licentious proclivities. Ultra-morality is frequently a defense against immoral tendencies.

Compensation is so subtle in its working that it often

foils interpretation. Where compensation is concerned, behavior can only be understood in terms of "either—or." Either a man is good because he is really good, or he is good because he is really bad. A person who cannot take orders from those in authority was reared by parents who were *either* too strict, in which case he has transferred his seething rebellion toward other superiors, *or* too lenient, in which case he has never learned to obey commands.

Compensation also serves to overcome or to conceal inferiority. The person who has some peculiarity or defect, real or fancied, which lowers him in the esteem of others, is goaded by a feeling of inferiority to make a show of strength, either fictitious or real. A sense of insecurity provides the spur which stimulates him with a zest for winning the admiration of his associates by some superlative achievement.¹

Compensation may be effected through "the neurotic fiction."² The individual may indulge in daydreams of greatness. He may strike a pose of audacity, concealing his cowardice under the display of bravado. The bluff may succeed. In any case, the goal is the restoration of his own self-respect, an end which may be achieved either in phantasy or reality.

The sense of inferiority may be more adequately allayed in the realms of reality. Compensatory activities may be antisocial or social in their consequences. On the one side is the criminal who seeks the spotlight of public attention by way of notoriety; on the other is the individual who devotes his life to the championing of the cause of justice on behalf of the laboring class of which he himself is a member.

Compensation may be direct. Years ago a child was born on a Missouri farm, who, from birth, was frail and

¹See W. F. Vaughan: *The Lure of Superiority*. 1928.

²See Alfred Adler: *The Neurotic Constitution*. 1921.

weak. Before he was ten years old, he saw his father die a drunkard's death. His mother was wasting away with consumption. He, too, was doomed to a consumptive grave. Doctors could do nothing for him. They agreed he could not live. But he did. And he grew up to become a renowned Physical Culturist. This was Bernarr Macfadden.

Compensation may be vicarious. A girl who is not graceful enough to be popular on the dance floor may devote herself to writing poetry. A boy who lacks the physique to win glory on the gridiron may achieve distinction, instead, in the classroom. Failure in one field of endeavor for which a person is ill-adapted may spur him on to assuage his humiliation through success in another field of activity.

D. Displacement. Displacement is a change of outlet for an emotional drive, an indirect expression due to the blocking of the direct pathway. Anger, as we have indicated earlier, need not eventuate in murder, if civilized sentiments intervene, but instead may be displaced to a different outlet such as fighting the liquor traffic.

Repression of a wish does not annihilate the urge. Suppressed desires, facing censure, escape in disguise. Displacement is one of the most deceptive of all the mechanisms. Elderly unmarried women, for example, denied a normal outlet for their sexual cravings, satisfy their longings through a morbid interest in births, marriages, and scandals.

The employment of euphemisms is a subtle form of displacement. The love of power is often disguised as "parental solicitude." American imperialism is masked as "protective benevolence." Japan is fighting a "defensive war" on Chinese soil.

Humor is often an excellent disguise for attitudes which would be shocking if they were given frank, direct ex-

pression. Mother-in-law jokes will nearly always provoke mirth, releasing venom that the young couple feel but dare not express to each other out of respect for filial loyalty. "Wisecracks" about the long-suffering of married persons affords a similar satisfaction.

When an emotion is displaced from a lower level to a higher one, it is said to be *sublimated*. Civilized modes of expressions are substituted for primitive ones. Sublimation is most often referred to in connection with the sex impulse, but of course it is just as applicable to other tendencies. Directing indignation at the eradication of a social evil such as child labor is considered a more cultured performance than setting out to destroy "the Hun." Similarly, the voyeurism of the sex impulse may be sublimated into physiological research, sadism into surgery, or exhibitionism into teaching. Carnal lust may be sublimated into social work, nursing, or Platonic friendship.

E. Projection. Projection is the process by which a person externalizes elements in his own personality by attributing them to other individuals or to the environment. Usually, the elements externalized are repugnant to the possessor because they degrade the ego. Instead of reproaching himself, the individual resorts to the more comfortable expedient of rebuking his neighbor. It is common for people to be especially sensitive to their own faults when they see them in others.

Peace of mind is often achieved by shedding the responsibility for failure. A poor workman blames his tools, the failing student blames his teacher, the unadjusted husband blames the institution of marriage. Faults are disowned. The lover who is untrue comes to suspect his beloved of infidelity. The person who cannot trust other people is the individual who distrusts himself.

The voice of conscience is often experienced in hallucinations, by means of which the person hears the voice of

God whispering in his right ear and the voice of the Devil whispering in his left ear.

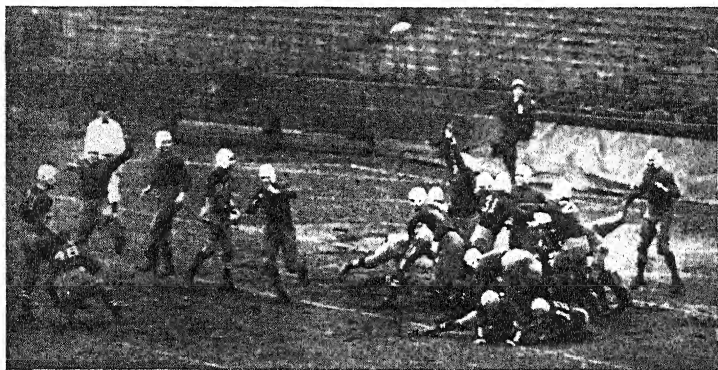
Delusions of persecution also involve projection. A man who is troubled by the unpardonable sin which he has committed thinks that people, who do not even know of his transgression, are talking about him and conspiring to punish him. The delusions are the externalization of his conscience.

Theology is replete with projection. Wishes become realities. The belief in a heavenly Father is the projection of the human family with the solicitude of the human father magnified into a God of love. The comfort to be derived from a belief in a God who cares deeply for each and every one of us is an inducement to translate the wish into a conviction about reality. Our faith is the product of our wishes. Yet such a view ignores the fact that there are many *objective* phenomena which suggest the operation of a divine intelligence in the world of nature, and which also suggest that our religious aspirations are more than mere wishes since they accord with the trend of evolution, as we see it in the order of things of which we ourselves are an integral part. To say that God is fictitious because our idea of Him is a projection of our wishful thinking is to reach a conclusion that is not justified by the evidence. Wishful thinking, indeed, may eventuate in sound conclusions. God may exist even though I like to think that He exists.

Projection is well illustrated in the case of the New Hampshire farmer who opposed the introduction of daylight saving time on the ground that God's time, he guessed, was good enough for him. Some people seem to think that God handed down the Ten Commandments to Moses in perfect King James English. One student refused to learn Greek because he felt that if English was good enough for Jesus Christ, it was good enough for him.

An individual's opinion may be so projected as to become the will of God. Thus a person who feels personally that gambling is wrong may condemn gambling because it is a violation of God's will, or justify negro slavery because it accords with the divine will.

F. Introjection. Introjection is the process by which an individual identifies himself with others, usually for the



ILLUSTRATING INTROJECTION

Notice the spectator in the background lifting his foot to help the player kick the goal.

(Reproduced by permission of Pictures, Inc.)

purpose of appropriating their desirable qualities. Frequently, the identification is made with some group the achievements of which reflect glory upon the individual members, some of whom contribute nothing, probably, to the collective success. Thus I may take pride in a football victory of *my* college or the attainments of a man who belongs to *my* fraternity. Boston, to any Bostonian, is the cultural center of the nation. Praise of *my* community is a subtle way of flattering *myself*. The fly on the axle of the thundering chariot boastfully shouted, "Lo, what a dust I raise!"

Introjection is practised by the spectator of a drama,

who identifies himself with the characters and lives through their experiences himself. In Georovesti, Rumania, when a cinema theater was opened for the first time, gaping peasants watching the screen were so terrified as they saw a locomotive hurtle toward them that they stampeded and wrecked the building.¹

Sir Bruce Bruce-Porter, prominent London physician, was treating a girl for a grave disease. The patient was reading a serial story in which the heroine was dying of the same disease. The story was obviously affecting her. Sir Bruce Bruce-Porter wrote the novelist and explained that, for the sake of his patient, the heroine of the story should, at all costs, be allowed to recover. The heroine got better—and the patient recovered, too.²

Empathy is another term for introjection. To empathize is to feel yourself into an object or the situation of another person. The sight of a Gothic arch is uplifting—it leaves the observer with a sense of aspiration. Similarly, the beauty of a colonial mansion is due in part to the feeling of strength which the observer derives from identifying himself with the stately pillars holding up the portico.

Riding in the seat of a car next to the driver, you have probably found yourself pressing your right foot on the floor board when an automobile darted suddenly into your path. At a track meet, the spectator kicks to help the high jumper over the bar, and at a football game the cheering section presses forward when the ball carrier plunges toward the goal line. It is easy to grow dizzy watching a man washing windows on a high building.

Sympathy is based on the capacity for introjection. An individual becomes dejected himself when he identifies himself with a person who has suffered some serious mis-

¹*Time*, February 9, 1931.

²*The Boston Post*, July 29, 1931.

fortune. It is especially easy to sympathize with a hero. Millions of people have been distressed by the Lindbergh kidnaping who never felt a tinge of pity when they heard of the abduction of some unknown child. So thoroughly do we, as human beings, feel ourselves into the lives of others, that we insist on our authors bringing their stories to a happy ending.¹

It is exhilarating to watch a game when the performers are experts. The spectator performs the acts of skill himself and goes home with a sense of work well done. Our heroes must be clever and they must also be lucky, for we like to feel we are the darlings of fate.

G. Transfer. Transfer is the mechanism underlying the conditioned response. A person reacts toward one stimulus as if it were another stimulus with which the first, by experience, has become associated. Thus a girl who was jilted by a medical student developed a hatred for all doctors. A person who gets a reputation for humor can never be taken seriously. Mark Twain once attempted to make a solemn speech and his audience laughed hilariously. They transferred their response to the humorous Mark Twain over to



ILLUSTRATING EMPATHY

How would you like to help clean up one of the towers of the Woolworth Building, with the hard, hard ground far below?

(Reproduced by permission of International Newsreel Photos, Inc.)

¹For a discussion of sympathy see F. H. Allport: *Social Psychology*, pp. 234f. 1924.

the serious Mark Twain, reacting to the latter as if he were the former.

Since transfer has already been covered at some length in the discussion of the conditioned response, no further space will be given the subject here.

H. Rationalization. As a psychological concept, rationalizing is a way of thinking, the aim of which is not to ascertain the truth but to satisfy a wish. Reason becomes the handmaid to prejudice. Henshaw Ward calls it "thobbing," since we "think out the opinion that pleases us and then believe it."¹ John Wesley described the process neatly when he asserted that "passion and prejudice govern the world—under the name of Reason."

When we reason to justify a desire or an action, we are rationalizing.² If you have some important work to do and a friend invites you to play golf on a course that you have always wanted to visit, you will convince yourself that health is a prime essential and conclude by believing that it is not merely a privilege to get out in the open, it is a duty you owe yourself and your family—and even your country. So convenient a thing it is to be a reasonable creature, since it enables one to find or make a reason for everything one has a mind to do.

We rationalize because we have certain ideals which we like to believe are embodied in our lives, and when we do not measure up to those ideals, we have to reconcile our failures in order to preserve our peace of mind.

Fundamentally, we rationalize because we like to think of ourselves as rational creatures, a conviction which is seriously jeopardized by constant reminders of our irrationality.

Love, for example, is blind. The motivation is instinc-

¹Henshaw Ward: *Thobbing*. 1926.

²See Ernest Jones: "Rationalization in Everyday Life," *Journal of Abnormal Psychology*, August–September, 1908.

tive, and largely unconscious, and obviously, at least to impartial observers, irrational. Attracted by lovely eyes or a beautiful gown, a man will insist that his lady's charm lies in her keen intellect or her spiritual aspirations. The motivation being unconscious, it is easy for consciousness to supply flattering explanations in the form of rationalizations. Thus, in spite of contradicting evidence, the human being can hold to his pet conviction that his conduct is guided by reason. The reasons evolved to account for behavior are logically acceptable, but manufactured *ex post facto*, and often untrue.

We are lazy but we like to think we are industrious.

The Real Reason

I love to lean upon my spade,
As the day begins to close,
To smell the scent of fresh-turned earth,
The fragrance of the rose.

I listen to the nesting birds,
As they chirrup in the trees,
And watch the bonfire smoke ascend
As gray wisps in the breeze.

I love to lean upon my spade—
I am like my fellow-men—
For when we're leaning on our spades,
We are not working then.¹

The shiftless often evolve a sophisticated defense for their inertia, singing praises for the art of "taking things easy" as constituting the essence of good living.

The philosopher is especially apt, by virtue of his profession, to flatter himself that his views of the universal scheme of things are the result of cold cogitation, and yet nowhere can there be found a more fruitful supply of evidence for the subtle intrusion of bias into the reasoning

¹*Pearson's Weekly*. By permission of *Pearson's Weekly*.

process, all the more deceptive because the philosopher is disinclined to recognize the role of desire. "A good many of us," says Uncle Eben, "thinks we's standing up foh de truth when we's only bein' obstinate 'bout a personal opinion."

Rationalization is a very elusive process unless the thinker is alertly on his guard.

Rationalization is the process of constructing a system of ideas, the real function of which is to justify some preëxisting desire or belief, without any attempt objectively to examine that desire or belief with reference to its truth. . . . Every thoughtful person is conscious of how profoundly he is influenced by desires and beliefs originating in his physical organism or his early training. Rationalization of these desires and beliefs is a subtle foe of the philosophical spirit.¹

Thoughtful persons may be conscious of the role of desire in philosophizing, as a general proposition, yet it is likely that they may not detect the particular occasions upon which their emotional dispositions give direction to their thinking.²

Rationalization has characteristic symptoms by which it can be detected by the careful observer. Exaggerated emotionalism is a mark of rationalizing. If someone says that two and two make four, nobody gets excited. But if someone says that all pacifists are cowards, somebody in the audience is liable to get excited.

A passionate fondness for our own opinions is another indicator of rationalization, a fondness for these opinions, not as ideas, but as an integral part of our very being. To have them disputed is to be insulted. Much of our reasoning consists in finding arguments for continuing to believe as we already do.

A third mark of rationalization is the conviction that

¹E. S. Brightman: *An Introduction to Philosophy*, p. 9. 1925. Reprinted by permission of Henry Holt and Co.

²See J. H. Robinson: *The Mind in the Making*, p. 45. 1921.

our judgments are obvious, and that questioning them is merely to carry scepticism to an absurd degree. They are beyond argument. There can be no doubt as to their validity.

When we consider the role of rationalization in thinking, it is easy to fall into the fallacy that rationalizing inevitably leads us to wrong conclusions. If we are honest in our thinking, we should suspect a conclusion arrived at by rationalization, but, at the same time, we should be prepared to accept it as valid if investigation reveals more sound reasons for holding to the same belief. "Sour grapes" may lead a person to think that a job he has lost was not good enough for him, anyway, and it may be true that a better position awaits him.

The grave disadvantage of rationalization, and all the other subtle adaptations, is that the resources of the individual get no chance to come into full play. If we are to regulate our lives intelligently, we must reason in planning and directing our activities and not reserve our thoughts for the purpose of justifying our conduct after the mistakes have already been committed.

It is obvious to the studious observer of conduct that the lines of distinction between the various subtle adaptations are vague. The mechanisms usually combine and interfuse in their functioning. Conflict motivates compensation, displacement, projection, rationalization, and so on. Rationalization implies dissociation, since one part of me succeeds in fooling "Me." Suppose I am attracted to a new job merely because there is a higher salary offered, but I do not want to confess my interest in money even to myself, so I say that I am called to "a larger field of service." In deceiving "Me," the rationalization acts as a disguise to escape the censor—it is, in other words, a displacement. If I reason that my failure in a task is due to your lack of coöperation, I am both rationalizing and

projecting. "Sour grapes" is rationalizing and compensating. Thus it can be seen that it is impossible to draw sharp lines of cleavage among the different processes of subtle adaptation. The mind has worked out a variety of defense mechanisms which reinforce each other to preserve the personality from disturbing shocks.

I. Integration. Organization of the conflicting trends of personality is called integration. A unified personality is not a gift but an achievement. Integration requires an effort toward systematization of the habits which have developed for specific situations, and which, therefore, may be unrelated and inconsistent. Integration, as a remedy for, and a prevention against, conflicting and dissociating trends, is more effective than the subtle modes of adaptation which we have just described.

An honest understanding of oneself is an important means of integration because it nullifies all attempts at self-deception. A person who fools himself is disintegrating in the very act of "kidding" himself along. The man who thinks he is pure in heart because he is a prude, the employee who blames his failure in business on the lack of pull, the joiner who appropriates to himself the credit for the achievements of some illustrious member of his club, the citizen who thinks it is justifiable to cheat on his income tax return because the government is squandering his money, the creditor who insists on the payment of a debt because of the principle of the thing, and the author of a lurid tale who insists his only motive is to point out the wages of sin—all of these people are deceiving themselves and thereby courting dissociation. There is nothing that so quickly undermines the unity of character as self-deception. The person who has the insight to see through himself so clearly that he is unable to delude himself by the invention of excuses for violating his best intentions, has erected a barrier against disintegration.

Organization of personality may be promoted by arranging for the appearance of a common factor in a variety of situations. Parental interest in all the child's activities, in the home, at school, on the playground, and at Sunday school, will help bring the different situations into some sort of comprehensible relationship. School programs must be planned in such a way as to give the student the impression there is some connection between the composition of a theme for English and the writing of an essay in a history examination. Religion, if it is to be of any value, must penetrate every phase of our lives in such a way that we shall not be shocked if the minister abandons transcendental theology long enough to dwell on some of the evils of our economic order.

Another integrative device is the appreciation of general principles. The person who has discovered why honesty is the best policy, whatever the circumstances, has taken an important step toward making honesty a general trait, and not just an isolated habit for special occasions. The search for the reasons underlying our conduct is a quest for general principles. This goal is the aim of philosophy. The individual who has worked out for himself an adequate philosophy of life recognizes that if his human career is to have any meaning, he must plan his conduct so that it will embody certain values which are paramount in his scheme of things. Taking time out for meditation, he orients his living to his fundamental purposes so that his life has direction. Centering his aims about certain definite ideals, the thoughtful individual is on the way to bringing some order out of his chaotic impulses. Organizing life about principles is an effective technique for making ourselves whole.

The assumption of responsibility is the remaining method of integration. There is an unfortunate tendency in each of us to evade responsibilities whenever there is a

way of escape. If we are approached by somebody who wants us to serve on a committee or to make a speech, the first impulse is to search for some plausible excuse. By worming our way out of the impending assignment, we deprive ourselves of an opportunity for building self-reliance through meeting the demands upon our personal resources. The challenge of a difficult task presents a valuable occasion for self-discipline. When the individual considers an end as important and assumes personal responsibility for its realization, he becomes imbued with a purpose that will sustain him in the pursuit of his goal, no matter how discouraging the obstacles in his path may be. The effort expended in achieving an end under trying circumstances is just the sort of coördinated activity that produces a healthy personality.¹

Training in the acceptance of responsibility is an effective integrating force in the evolution of personality. A child should be assigned a task in the family chores for which he is encouraged to feel an obligation. Work and responsibility are as indispensable for the development of character as food and exercise to the body. Purposeful activity requiring sustained effort in the interest of others contributes in an important way to the organization of personality. The child should be forced, as soon as possible, to assume the responsibility for watching the clock and for getting to school on time. It is through such little incidents that a sense of self-confidence is nourished. A child should learn how to work, how to value his services, and how to handle money. The discharge of these functions helps him to mature.

The adult, too, needs a job that gives him a sense of usefulness. The work should not be too easy or too hard. It should be difficult enough to challenge his full resource-

¹See W. F. Vaughan: "Get Yourself Organized," *The Modern Psychologist*, February, 1937. Reproduced by permission of *The Modern Psychologist*.

fulness. Most of us shirk responsibility whenever we can respectably escape it, thus depriving ourselves of opportunities for building up personal stability.

Integration is essential to that effective living which is the basis of happiness. The unity derived from a life well organized around interests which are valued enough to stimulate sustained effort for their fulfillment is the best insurance against the ravages of mental conflict. A great purpose is sure to generate a wholesome personality.¹ ///

SUMMARY

Inconsistencies in conduct are inevitable, due to the heterogeneity of desire. Incompatible reaction tendencies, warring habits, the ambivalence of our impulses, and the pressure of group taboos generate conflict. Peace of mind and self-respect are maintained by defending the ego against the admission of primitive and bestial cravings, through various devices of self-deception.

Repression, the insistent denial of an urge, is unwholesome because it removes the desire from conscious control and promotes deception.

Going to pieces by means of dissociation is certainly undesirable, since it deprives the individual of the chance for coördinated effort at the very time when an organized attack upon the problem is called for.

Compensation means going to one extreme as a defense against a tendency toward the other extreme. Excessive behavior results. This defense mechanism may be of social value, depending on the nature of the reaction.

Displacing an emotional drive from one outlet to another may be a good solution to a conflict if the change is to a higher level, as it is in sublimation.

Projecting undesirable qualities upon other persons is

¹See W. H. Burnham: *The Normal Mind*. 1929.

an unhappy technique for self-deception, since it prevents a person from recognizing and correcting his own shortcomings.

Introjection, the appropriation of admirable qualities in others, is often called identification. The mechanism may have merit if it stimulates emulation.

Transfer is the mechanism involved in conditioning. A reaction to one situation may carry over to other situations partially identical. This principle affords considerable insight into our own reactions and the responses of others.

Rationalization, thinking to satisfy a wish, is perhaps the favorite defense mechanism for the person who is forced to reconcile his ideals and his failure to attain them. Conclusions reached by rationalizing may or may not be true.

Mental hygiene has discovered that happiness depends upon integration as the most effective means for the prevention and cure of conflict. The integrated personality is achieved by organizing activities in accordance with principles of conduct that provide a plan for effective living.

THE FORMATION OF HABITS

IN THE DAYS when Darwin's evolutionary theory was a center of scientific interest, instinct was the rage in psychology. McDougall's *Introduction to Social Psychology*, published in 1908, reawakened a widespread interest in man's instinctive nature. For a while every sort of behavior was explained in terms of some one instinct or a combination of instincts.

But many psychologists were soon convinced that the instinct-psychology was fruitless. There was too much theory and not enough scientific observation. Ignorance of genetics encouraged the formulation of hypotheses without experimental bases. As a result of such convictions, there came a shift to *habit* as the explanation of human conduct. Heredity, nowadays, is discounted by many psychologists to whom training is everything.

Some psychologists have even gone so far as to assert that all babies are alike at birth, and that the individual discrepancies which appeared later were merely the results of training.¹ Watson, Dorsey, and Adler insisted that a person could make anything out of anybody with the proper methods of training.² It is a very encouraging doctrine. The story of the two frogs who fell in their separate pails of milk is a parable of such optimism. The

¹The behavioristic view that children can be taught anything has not been borne out by the observations of Dr. Arnold Gesell in his studies at the Yale Clinic, some of which have been recorded for the talking pictures.

²See especially Alfred Adler: "Character and Talent," *Harper's Magazine*, June, 1927.

first frog said to himself, "This is a strange situation. I am not equipped to solve it. My personal resources are inadequate. I might as well sink and get it over with." So he drowned. The second frog cogitated thus, "Here I am in a challenging predicament. How intriguing! Now is my chance to show what I can do in a trying situation. I'll fight it out to the finish." He "trod milk," as it were, through the long night and as dawn drew nigh, he found himself astride a mound of butter, safe and sound. Excelsior!

Such a sunny view of life is apt to degenerate into superficial optimism. We should try to solve the problems of life, but with a recognition of the limitations within which we must work out our salvations. We may not know exactly what our limits are, yet that does not appear to be sufficient reason for assuming there are no limits. One cannot make a genius out of an idiot, even through creative education. It is wise to recognize our limitations, but it is foolish to lay all the emphasis on them. If a boy is awkward in his muscular coordinations, he would show more insight if he tried to become a scholar, given a modicum of intelligence, instead of straining after athletic glory. The truth probably resides in the middle path—between the two extreme emphases—heredity, on the one hand, and training, on the other.

I. NATURE AND NURTURE

There is, indeed, some advantage to this new emphasis. The formation of habits can be observed and controlled. There has developed an optimism which no longer capitulates to the limitations of heredity. With the proper training, assert the new enthusiasts, anybody can become anything. Men are built, not born. Watson says:

I can take the squirmings of the throat muscles, and weave them into those highly organized acts we call talking and singing

(and, yes, even thinking). I can take the infantile squirmings of the gut—the unstriped muscular tissue of the alimentary tract, diaphragm, heart, respiration, etc.—and actually organize them into complicated emotional responses we call fears, loves, and rages.

The behaviorist asks for nothing to start with in building a human being but the squirmings everyone can see in the newborn infant.¹

Alfred Adler says:

Talent is not inherited, and . . . the possibilities and potentialities of any individual for performance are not fixed.

The development of a personality cannot be foretold from the phenomena of physical inheritance. The inherited instruments with which we fight the battle of life are very varied. *How we use these instruments*, is the important thing.

We can never tell what actions will characterize a man if we know only whence he comes. But if we know whither he is going we can prophesy his movements toward his objective.

The great accomplishments, the really worthwhile achievements, have been made by individuals whose equipment was poor.²

The attitude of many contemporary psychologists toward the relative importance of heredity and environment is that people do not do what they do, because they are urged from within, but because they are driven from without. In other words, one's environmental situations are more impelling than one's inborn drives. Knowledge about the world in which a given individual lives sheds more light on an understanding of his personality than any citation of hypothetical instincts.

The new optimism in psychology, with its whole stress upon habit building, can be exaggerated. It is true that none of us ever realizes his full potentialities. It is true

¹John B. Watson: "The Behaviorist Looks at Instincts," *Harper's Magazine*, July, 1927.

²Alfred Adler: "Character and Talent," *Harper's Magazine*, June, 1927.

that life situations are an important factor in our development. It is true that training can produce startling results. It is true that an optimistic outlook encourages successful achievement. But it is not true that heredity can be ignored.

A study of animal breeding is convincing evidence that heredity counts heavily. Witness, for example, the sons of the remarkable race horse, Man O' War: Mars, Scapa Flow, Dress Parade, American Flag, By Hissself, and Crusader—all of whom were winners in many of the outstanding race events in which they were entered. This is no indication that heredity is the whole story either for animals or human beings. It does, however, seem to show that blood will tell, as it has in the Darwins, Edwardses, Beechers, Lowells, and Adamses. Studies by Galton, Cattell, Brimhall, and Terman have demonstrated that relatives of distinguished men stand a good chance of becoming distinguished themselves. Galton's study of 100 scientific men revealed 28 notable fathers, 36 brothers, 20 grandfathers, and 40 uncles.¹ Cattell found that 43 per cent of our leading scientific men have come from the professional classes.² Brimhall discovered that there is an increasing number of distinguished relatives with increasing closeness of relationship. A brother of a man of science, for example, is twice as likely to be distinguished as a father of such a person.³ Terman found the majority of the gifted children he studied came from families of distinctly better than average ability. Nearly one quarter of the members of the Hall of Fame are known to be related to one or more of the subjects.⁴

¹Francis Galton: *English Men of Science: Their Nature and Nurture*, pp. 14, 49, 50, 53. 1875.

²J. M. Cattell: "Families of American Men of Science," *Popular Science Monthly*, 1915, 86, 504-515.

³See C. E. Skinner: *Readings in Psychology*, pp. 195-197. 1935.

⁴L. M. Terman: *Genetic Studies of Genius*, Vol. I, *Mental and Physical Traits of a Thousand Gifted Children*, pp. 85, 110-111. 1925.

As applied to characteristics, heredity and environment are not mutually exclusive categories. Bow-legs may result from hormone and (not *or*) vitamin deficiency. Hereditary and environmental factors may be distinguished, however, where differences between particular specified individuals are concerned. For example, one man may have a dark complexion because of his genes, and another man may have a dark complexion because of exposure to sunlight. No distinction between nurture and nature is generally valid. The particular facts of each specific case must be taken into consideration. It is a common fallacy to assume that if a characteristic is affected by the environment, it cannot be hereditary; that if it is hereditary, it cannot be influenced by the environment; in other words, that characteristics fall into two mutually exclusive groups in respect to these matters.¹

When Watson asserts that he can make any *normal* child into a doctor, lawyer, merchant, or chief, he excludes by definition all genetic classes with insufficient capabilities for adjustment. His claim is true only as a positive statement. The negative conclusion is untrue: that heredity has nothing to do with the diverse aptitudes, temperaments, and fates of individuals.

There is danger in drawing negative conclusions from positive observations. It is definitely fallacious to hold that the discovery of one cause requires the exclusion of another.² The significant point in Watson's assertions is that it would require different treatment to train different individuals to be lawyers. As Jennings says, it is no news that unfit persons may be made into lawyers, but it should be realized that good merchants may be spoiled in the process.³

The most important contribution of genetics is denied

¹H. S. Jennings: *The Biological Basis of Human Nature*, p. 147. 1930.

²*Ibid.*, p. 217.

³*Ibid.*, p. 179.

by the Behaviorism of Watson, namely, that human beings are endowed with diverse tastes, temperaments, aptitudes, and diverse ways of responding to the same conditions.¹ Respect for the individual involves the recognition of hereditary differences. This is a fundamental axiom of the psychology of individual differences.

It is easy to fall into the error of ignoring the fact that even at birth behavior already has a past history during which learning has occurred. It has been suggested that much of the specific activity present at birth has been prenatally learned. According to Coghill, foetal behavior begins as a mass activity with an integrated total pattern from which more specific behavior patterns evolve by progressive individuation.² Studies of the mammalian foetus by other investigators suggest that the first movements noticed are head bending and trunk bending. The limbs are first moved as a whole, followed in sequence by elbow, wrist, and finger movements as individuation progresses peripherally. Behavior, accordingly, begins with a total integrated pattern from which partial patterns become separated as development progresses.³ Certain evidence has been gathered which contradicts Coghill's theory of the primacy of mass activity. Bridgman and Carmichael, in observing the onset of behavior in the foetal guinea pig, find that the first active responses are definite in character. There is no gradual progressive individuation out of a total pattern. The earliest behavior in a foetal guinea pig is of a specific nature rather than generalized or totally integrated.⁴ In the light of

¹Ibid., p. 222.

²See G. E. Coghill: *Anatomy and the Problem of Behavior*, p. 38. 1929.

³L. Carmichael: "Origin and Pre-Natal Growth of Behavior," in *A Handbook of Child Psychology*, C. Murchison, Editor. Second edition, revised, 1933.

⁴C. S. Bridgman and L. Carmichael: "An Experimental Study of the Onset of Behavior in the Foetal Guinea Pig," *The Journal of Genetic Psychology*, 1935, 47, 247-267.

foetal: pregnancy

the present evidence, no dogmatic conclusions can be drawn with respect to this theory of mass activity.

There is, however, considerable evidence to support the assertion that reflexes are learned before birth. C. M. Child has shown experimentally that the growth of the nervous system is influenced by internal or external stimulation. The growth of the nerve cell from the central axis is not spontaneous, but is initiated and directed by the conditions of the surrounding tissues.¹ The sensory and motor fibers involved in the evolution of reflex activity grow because of stimulation. Reflexes develop as adjacent neurons concurrently active tend to be joined functionally.²

The relative importance of nature and nurture is complicated by the fact that it is impossible to determine how much of a person's development is an unfolding of latent capacities, merely evoked upon the occasion of an adequate stimulus. A living creature grows from within.³

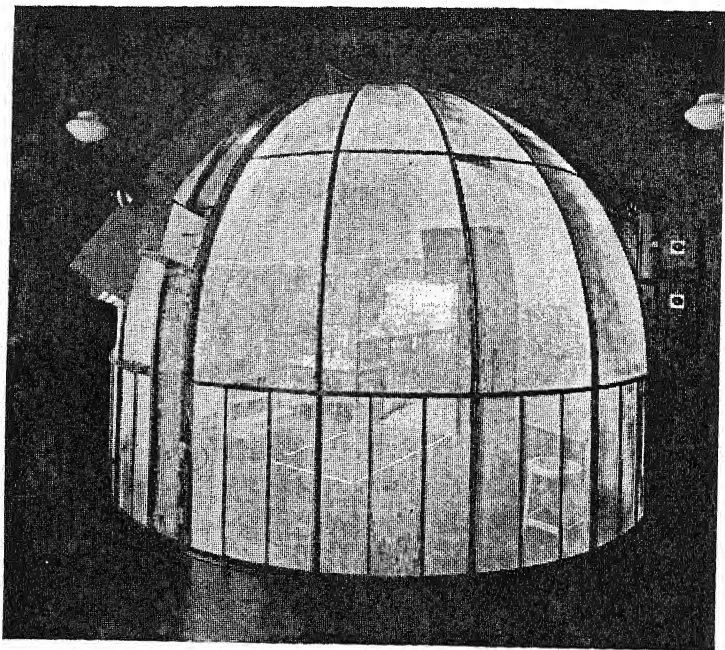
The process of growth from within is known as maturation. For a considerable period, while the instinct theory was particularly under fire, the influence of organic development upon behavior was ignored, and there was a tendency to attribute all increments in learning to environmental training.⁴ Maturation fell under the general suspicion directed against native factors in behavior. More recently, the importance of maturation has been realized, through the studies of Gesell and others who have been making careful observations of growth in infancy and childhood. If a certain behavior pattern appears at

¹C. M. Child: *Physiological Foundations of Behavior*. 1924.

²For an excellent summary of the material on this subject see L. F. Shaffer: *The Psychology of Adjustment*, pp. 28-40. 1936.

³See A. Gesell: "Maturation and Infant Behavior Pattern," *Psychological Review*, 1929, 36, 308-319.

⁴See P. A. Witty and H. C. Lehman: "The Instinct versus the Maturation Hypothesis," *Psychological Review*, 1933, 40, 33-59.



THE PHOTOGRAPHIC RECORDING AND OBSERVATION DOME

The dome is located in the laboratory of the Yale Clinic of Child Development. The interior of the dome is illuminated. The surrounding laboratory is darkened. The infant is examined in the clinical crib in the center of the dome. The dome is encased in a one-way vision screen which permits complete visibility for the observers outside but conceals the observers from the infant. A motion-picture camera enclosed in a sound-quieted box attached to the curved track of the dome makes a cinema record of the infant's behavior.

(Reproduced by permission of Arnold Gesell.)

about the same stage in a number of children despite the differences in their experiences, it seems clear that maturation is responsible. Problems have been planned to determine the various ages at which these specific tasks can be performed, and there is a striking uniformity in the manner in which progress gradually unfolds.

Developmental schedules have been studied to determine the norms. Motor characteristics, for example,

appear as follows, covering the first eighteen months of life:

FOUR MONTHS

Prefers to lie on back
Tries to raise self, lifting head and shoulders
Can roll from side to back (or back to side)
Holds head erect when carried
Lifts head when prone
Pushes with feet against floor when held

SIX MONTHS

Prefers to sit up, with support
Can roll from back to stomach (or stomach to back)
Uses hands to reach, grasp, crumple, bang, and splash
Opposes thumb in grasping cube

NINE MONTHS

Sits up without support
Makes stepping movements when feet touch floor
May creep or hitch
Opposes thumb in picking pellet

TWELVE MONTHS

Stands with support
Creeps or hitches alone
Walks with help
Shows a preference for one hand in reaching
Scribbles imitatively with a crayon

EIGHTEEN MONTHS

Walks alone
Climbs chair or stair
Throws ball into box
Scribbles spontaneously

These normative summaries may be used as cues for preliminary clinical orientation and for rough classification in cases of retardation.¹

¹A. L. Gesell: *The Mental Growth of the Pre-School Child*, pp. 378-381. 1925. By permission of The Macmillan Company, New York. See also Gesell, *et al.*: *The Psychology of Early Growth*, Chap. 8, "Maturity Level Summaries." 1938.

Gesell has made a motion-picture record of the progressive behavior of some of the infants in the Yale Psycho-Clinic, demonstrating beautifully his developmental examination procedures.

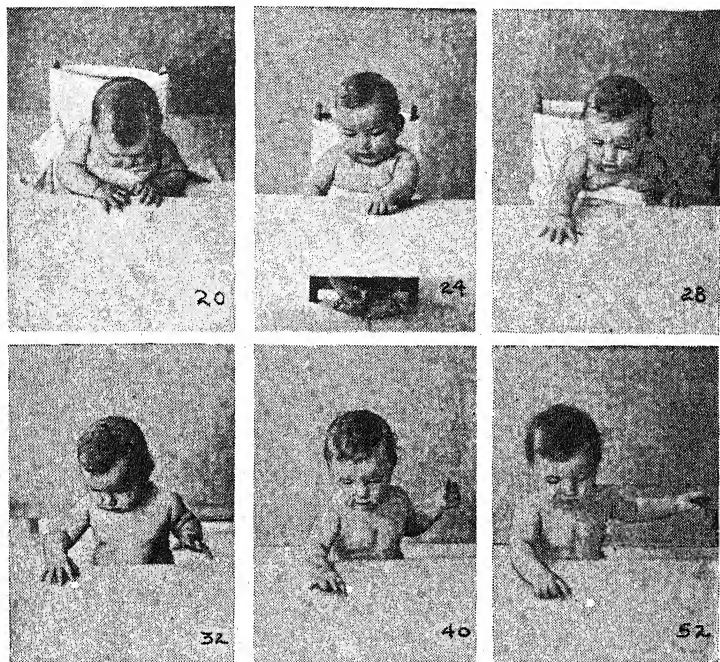
The course of behavior development has been charted in a graphic manner. The infant is seated in a diminutive Morris chair at a table. A small sugar pellet is placed upon the table, within the infant's arm length.

He is sixteen weeks, or four lunar months of age. He fixates upon the examiner's hand as the pellet is placed in position. Rarely he fixates upon the pellet. At twenty weeks he may regard the pellet and advance upon it with the crude inward approach of one or both hands. At twenty-four weeks he scratches with pronate paw-like hand in the vicinity of the pellet. At twenty-eight weeks he may rake it up with simultaneous flexion of the fingers against the palm. At thirty-two weeks the thumb and forefinger begin to display a preëminence in the prehensory act. This preëminence becomes progressively perfected so that at forty weeks the infant plucks the pellet with pincer-like utilization of the index finger and thumb. At fifty-two weeks he plucks the pellet yet more adeptly and may deposit it in the mouth of a bottle, though his own mouth remains a strongly competing destination. . . . Behavior grows. Every lunar month witnesses distinguishable changes in the patterning of the behavior manifestations. . . . So swift and continuous are these changes that in the first six years of life the individual traverses far more development ground than he will ever again compass in a similar period.¹

The problem of pupil readiness for various elementary school subjects shows how important it is to get the facts about maturation. What is the best age for starting to train a child in reading? If a child begins to learn how to read when he is too young, the effort exceeds the gain derived, and the child may become so discouraged as to

¹Arnold Gesell: "The Study and Guidance of Infant Behavior," in *Psychology at Work*, Paul S. Achilles, Editor. By permission of McGraw-Hill Book Co., Inc. 1932.

develop a prejudice against books. If he waits until he is older, it is much easier for him to learn how to read and he can make such good progress that it would seem the



PATTERNS OF PELLET PREHENSION AT 20, 24, 28, 32,
40, 52 WEEKS

(With the permission of Dr. Arnold Gesell. From Volume 18, No. 2, *Proceedings of the National Academy of Sciences*, and from an educational picture, "Life Begins.")

delay were advisable. Morphett and Washburne¹ set the reading readiness minimum at a mental age of six years and six months.² There is substantial agreement

¹M. W. Morphett and C. Washburne: "When Should Children Learn to Read?" *Elementary School Journal*, 1931, 31, 496-503.

²Mental age is determined by the tasks that a normal child of a certain chronological age level can solve. This concept will be further explained in Chapter 12. Note that mental age does not mean the same as chronological age.

that this figure is approximately sound. The chances for failure are materially reduced by postponing the study of reading until this mental age level has been attained. Reading readiness may be fostered, however, by special training, such as the development of a wide speaking vocabulary and practice in keeping a series of ideas in the mind in their proper sequence.¹ Tests for estimating reading readiness are available.² Similar research has been done regarding arithmetic readiness. Washburne has found that "for each arithmetic topic there is a stage in the children's mental growth before which it is ineffective, if not futile, to teach that topic, but after which most children can learn it with reasonable effectiveness."³

The problem of readiness requires much more investigation before we can reach any definite conclusions. Some educators advocate delaying the teaching of various subjects until pupils can assimilate them easily, while others are in favor of starting the training program as soon as the child gives evidence of a desire to learn particular activities, taking special care, of course, not to force the child into performances which will impose an undue strain upon him.⁴

The influence of maturation has been studied by the method of co-twin control. Identical twins have practically the same heredity. One twin is trained in a given task, the other is reserved as a control. Twin T is trained for ten minutes daily over a period of six weeks in stair climbing, beginning at the age of forty-six weeks. At forty-eight weeks she scales the stairs for the first time with

¹See M. L. Harrison: *Reading Readiness*, p. 32. 1936.

²M. J. Lee, W. W. Clark, and D. M. Lee: "Measuring Reading Readiness," *Elementary School Journal*, 1934, 34, 656-666.

³C. Washburne: "Mental Age and the Arithmetic Curriculum," *Journal of Educational Research*, 1931, 23, 210-231.

⁴C. Washburne: "Children Must Be Ready to Learn," *The Parents' Magazine*, October, 1937.

slight assistance. At the conclusion of the six weeks' training period (age, one year) she is a relatively expert climber. At the age of one year, her untrained co-twin C cannot yet scale the staircase, even with assistance. At the age of fifty-three weeks, however, C climbs to the top of the staircase without any assistance, and without any previous specific training whatsoever. The pattern of C's climbing is purely a function of maturation. Then C is given two weeks' training and at the age of fifty-five weeks she approaches the skill of Twin T. A motion-picture record compares the climbing ability of C at fifty-five weeks, after two weeks' training, with that of T at fifty-two weeks, after six weeks' training. Although T has been trained three times as long and seven weeks earlier, this advantage is more than overcome by the three weeks of C's added age. The influence of maturation upon the climbing skill of infants is thus clearly revealed.¹ A similar study of the acquisition of language in the same pair of twins likewise discloses the effects of maturation.²

McGraw gave one identical twin elaborate training in motor skills while the other twin was allowed to mature without any coaching. Her investigation revealed that some activities like reaching for toys, crawling, and standing up alone, sitting erect, and grasping objects all appeared in both youngsters at the same time without regard to training, whereas climbing, roller skating, and leaping from elevated positions were definitely developed by training alone. The control twin, however, was able to benefit to such an extent from coaching when it was finally

¹A. Gesell and H. Thompson: "Learning and Growth in Identical Infant Twins: An Experimental Study by the Method of Co-Twin Control," *Genetic Psychology Monographs*, 1929, 6, 1-123.

²L. C. Strayer: "Language and Growth: The Relative Efficacy of Early and Deferred Language Training by the Method of Co-Twin Control," *Genetic Psychology Monographs*, 1930, 8, 209-319.

given to him as to indicate that maturation had functioned to increase his learning facilities.¹

It is apparent from these studies that the infant develops in response to his environmental influences, but that basically his progress is an unfolding of his native capacities. He is a product of both environment and endowment. In the total picture his growth potencies play an important role. Improvement in the performance of any task is not wholly due to practice, but, in part, to organic maturation.

Jennings sums up the matter by stating that identical twins, when reared separately, reveal marked differences as the result of their distinct environments, but they disclose more likenesses than can be accounted for on any basis except their identity in genetic constitution. Effects produced in one case by genetic constitution may be produced in another case by environment.²

Newman, Freeman, and Holzinger are also convinced that what heredity can do, environment can do also. In the first place, they compared the resemblances or differences of identical twins and fraternal twins brought up in the same environment (the same, so far as possible). Identical twins have the same heredity, fraternal twins differ by measurable degrees in genetic constitution. Identical twins, as the investigation revealed, are decidedly more alike than are fraternal twins. In the second place, they compared individuals genetically the same (identical twins), but reared in measurably different environments, with respect to their resemblances and differences. The study showed that identical twins,

¹Myrtle McGraw: *Growth: A Study of Johnny and Jimmy*. 1935.

²See H. S. Jennings: *The Biological Basis of Human Nature*, pp. 166-169. 1930. See also H. J. Muller: "Mental Traits and Heredity: The Extent to Which Mental Traits Are Independent of Heredity, as Tested in a Case of Identical Twins Reared Apart," *Journal of Heredity*, 1925, 16, 433-449, and H. H. Newman: "Mental Traits of Identical Twins Reared Apart," *Journal of Heredity*, 1929, 20, 49-64; 97-104; 153-166.

reared separately, differ more than comparable identical twins brought up together. They found that the relative effects of heredity and environment differ for different traits. Physical characteristics are least affected by the environment; intelligence is affected more; educational achievement still more; and personality or temperament, if the tests can be relied upon, the most. Differences in social and educational environments did produce variations in intelligence and school achievement. More specifically, it was found that intelligence is definitely modified by large differences in education, both of the formal and the informal sort.¹

The conclusion reached by Newman, Freeman, and Holzinger that intelligence can be modified to some degree does not controvert, however, the results of Terman's study in California, which indicated that the "inherent intellectual capacity of an individual cannot be very greatly increased by any known means of mental training at any period of mental development, and that under present educational conditions, the differences in ability and in achievement between school children are due to a far greater extent to differences in inherited nature than to differences in environment or in educational opportunity and training."²

Another method of separating the effect of heredity from that of environment is to study foster children who are separated from their parents in infancy. If the new environment is of a higher grade, and the intelligence or behavior likewise progresses beyond what would have been expected had they remained with their own parents, the

¹H. H. Newman, F. N. Freeman, and K. J. Holzinger: *Twins: A Study of Heredity and Environment*. 1937.

²B. R. Simpson: "Training the Intellect," *Scientific Monthly*, October, 1936. See *The Yearbook of the National Society for the Study of Education*, Vol. I, "Nature and Nurture: Their Influence upon Intelligence," and Vol. II, "Nature and Nurture: Their Influence upon Achievement." 1928.

difference may be attributed to the change in the environment. The evidence collected by Freeman and his associates indicates that children whose environment has been improved by adoption, are themselves improved in both intelligence and conduct.¹

An adequate account of the human being must include both nurture and nature. Training is important—but what is going to be trained? Stimuli are effective—but what is going to be stimulated? Environment exerts a potent influence on the inherent nature of the individual.

II. THE GROWTH OF HABITS

In our present ignorance it is useless to draw a sharp line between heredity and environment. We can, however, be sure that experience does modify nature. Habits are built from the stuff of heredity.

Emotions, for example, are soon developed into habits. Habits are activities which have been repeated so often as to become automatic. Habitual behavior becomes second nature. There must, of course, be some motive for repeating an act. The fundamental urges impel us to the repetition which establishes habit. Habits are quickly acquired where interest is involved. Pleasant, that is, satisfying consequences encourage the recurrence of a given activity.

Habits are usually conceived as explicit actions, but of course there are habits of thought as well as habits of an explicit nature. Table manners are habits of action. Prejudices are primarily habits of thought. The “crape-hanger” has the habit of seeing the gloomy side of a situation. The person with a dirty mind sees the bad in everything. Any technique is a habit of thought. Some

¹F. N. Freeman, K. J. Holzinger, and B. C. Mitchell, Chap. 9 in *Twenty-seventh Yearbook of the National Society for the Study of Education, Part I*, 103-217. 1928.

people go at a problem slowly and surely; some just slowly; some fast and unsurely; and some fast and surely.

Wrong habits of thinking, like suspecting everybody of antagonistic designs, may evolve into confirmed modes of reaction involving serious maladjustment. Such habits should be corrected in their initial stages.¹

A. Conditioning. Repetition may ingrain a mode of behavior so that it becomes an integral part of the individual. The process of habit formation is fundamentally that of conditioning responses. Repeated association of stimuli and responses builds in conditioned behavior, as learning advances.

How are bears, for example, trained to dance? The bears are stationed on a heated surface while music is played. When this situation has been repeated a number of times, the bears will dance on an unheated surface when they hear music, because a connection has been established between *music* and *hot surface*. The bears, therefore, when they hear music, dance as if they were still bothered with hot feet.

Human beings acquire their habits in a similar fashion. A child may be given medicine, the disagreeable taste of which is alleviated with grape juice. Later, the sight or smell of grape juice is enough to provoke a spell of nausea.

1. Substitution. Conditioning is effected through substitution. It may be a substitution of one stimulus for another, or a substitution of one response for another.

a. Substitution of a Stimulus. Suppose a young man is in love with a girl who resembles her mother. Other factors being equal, he will feel (response) toward the mother (stimulus) as he does toward the girl (stimulus).

b. Substitution of a Response. Suppose some night the mother is so disagreeable as to inform him that he is not

¹J. J. B. Morgan: *Keeping a Sound Mind*, Chap. 7, "Correct Thinking." 1934.

good enough for her daughter. He will then have a grudge (response) instead of a feeling of adoration (response) toward the daughter (stimulus) as well as toward the mother (stimulus).¹

2. Dominance. If a dog is given meat powder and if, at the same time, an electric shock is applied to one of his paws, will he respond by secreting saliva, or by retracting his paw, or will he do both? Experiments show that the animal does one or the other but not both and that the particular response elicited depends upon which stimulus is dominant. If the meat powder is abundant and the shock is weak, he salivates; if the meat powder is scanty and the shock intense, he withdraws his paw. Whichever response occurs is reinforced by repetition of the situation, and the other response, in time, disappears.² We shall see how the principle of dominance may apply to the conditioning of human behavior, in connection with the curing of fear.

3. The Time Factor. In considering the time factor, there are two possibilities to be taken into account: the two stimuli may be simultaneous, or the substitute stimulus may appear before the original stimulus (the bell rings, then the food appears). Pavlov reports that the maximum conditioning occurs when the (substitute) stimulus is given from .2 to 2 seconds before the original stimulus, that is, when the food follows the bell.³ The two stimuli may be separated by a considerable interval and association will still result. Pavlov has reported such separation effective for intervals as long as thirty minutes. The ability to appreciate the belongingness of objects and events will, of course, determine the possible length of the

¹See J. B. Watson: *Behaviorism*, Chap. 2. Revised edition, 1930.

²G. H. S. Razran: "Theory of Conditioning and Related Phenomena," *Psychological Review*, 1930, 27, 1-12.

³See E. R. Guthrie: *The Psychology of Learning*, Chap. 4, "Time Factors in Conditioning." 1935.

interval. If the substitute stimulus is repeatedly given without reinforcement from the original stimulus, temporary extinction takes place, that is, the substitute stimulus no longer evokes the conditioned response. For example, if the bell is rung repeatedly and no food appears, the salivary reflex is no longer elicited by the sound of the bell. Temporary extinction may disappear after a period of rest. When extinction is carried out repeatedly, recovery is progressively diminished until it no longer takes place.

B. The Education of the Emotions. In the past, education has been primarily intellectualistic, though it has long been recognized that successful living is fundamentally an emotional matter. Most of the emphasis has been placed upon the inculcation of information and knowledge. Yet a cultivated intellect is not nearly so important for happiness as well-trained emotions. The education of the future, if it aims, as I assume it will, at producing happier human beings, will give more and more heed to the emotional aspects of human nature. An article written by a graduate for one of the Vassar publications shows a profound appreciation of this vital need in college:

Among my friends there are a few who are geniuses in the field of business, literature, music, and engineering. And yet I have looked behind the curtains of their homes, and the things I see there freeze my marrow with pity. Here is an engineer, master of the principles that control the natural world about him, who cannot control the devils that ride him, and who has wrecked three lives through his jealous passion. Here is a rich business executive, who directs the destiny of a corporation, and yet cannot guide his own sottish son, or level the barricade of hatred between him and his wife. And here, there, and everywhere are friends and relatives ruining themselves with bigotry and egotism, wearing out their lives in loneliness because of timidity, or else consumed by the worm of satiety and ennui. . . .

What can Vassar do about it? that is, if she considers such a superficial problem worth troubling about? If it is possible for

a faculty, largely unmarried, to show girls how to get along in their own homes, do so, I pray, in the name of many wearied families. . . . More than fifty per cent of Vassar students are going to be called upon to exert, not so much their intellects as their ability to get along with people, including perverse husbands and eccentric cooks. Somehow or other I wish that sympathy might be fostered, and unselfishness and tact and a desire to help. And, above all, a sense of humor.¹

Just as a person's intelligence is supposed to mature at a normal rate, so his emotional growth should proceed from lower to higher levels with the approach to adulthood. The normal person, as he grows up, matures in his emotional patterns. Childish modes of reaction are outgrown. The adult "acts his age."

1. Fixation. Progress toward maturity is often checked by influences which arrest development. Whether a person will grow up emotionally depends very largely on the training he gets at the hands of his elders. Pampering, coddling, and babying tend to retard emotional development. When a person remains too long at a certain level of emotional evolution, he is said to be fixated.

Negativism, the technical term for what used to be called "pure cussedness," is characteristic of the emotional behavior of a child between the ages of two and four. The negativistic person does the opposite of what he is told to do. "Keep off the grass" is merely a challenge to get on the grass. Such rebellious self-assertion is to be expected of a child, but in an adult, it is regarded as "childish," that is, out of keeping with his age. Some people are adults only in the chronological sense. Emotionally, they are still just "kids." Individuals who drink spirituous liquors as a protest against prohibitions belong in the negativistic category. They are cases of arrested emotional development.

¹Margaret M. Miner, in the *Vassar Quarterly*.

Sulking is a childish reaction. Adults are expected to work out their mutual adjustments at a higher level. Once in a while a man and wife live together in glum silence, nursing their separate grievances, and refraining doggedly from addressing each other by word of mouth. Usually such a hostile silence is the aftermath of a quarrel.

Fixations are apt to occur in the love life, especially when parents spoil a child with such an overindulgence of affection as to render the severance of the apron strings impossible. At maturity a person should be in a position to assert his emotional independence, break the family bonds, seek a mate, and establish a home of his own. When John Ruskin was twenty-nine, his mother decided that perhaps it would be best for him to marry, so she selected a wife for him from among the daughters of her own few friends. This girl, Euphemia Chalmers Gray, was beautiful, vivacious, charming, and ten years Ruskin's junior, and he was casually interested in her; so he married her April 10, 1848, and he was joined on a belated wedding tour by his father and mother.

An adult is entitled to a life of his own, with the assumption of responsibilities outside the narrow circle of his ancestral fireside. Fixated persons may be so imbued with nesting habits that they cannot spread their wings and fly. Parental tenderness which promotes a crippling dependence is short-sighted and essentially selfish, however noble it may seem to the sentimentalist.

2. Regression. In Chapter 2, in the section on Jung, a description of the relation between fixation and regression was given. Growth proceeds against obstacles. If the difficulties prove insurmountable, fixation occurs. Further struggle may result in renewed progress. When the new tasks prove discouraging, there is a tendency to regress, to go back, to an earlier stage of development, to

the point of fixation. The stronger the fixation in the past, the more likely is regression in the present.

The girl who at last finds a man who remotely approximates the perfection of her daddy, may be induced under pressure to enter the holy bonds of matrimony, but when the first serious quarrel arises, she packs her suitcase and flees for moral support back to the family hearth where she knows she can count on protection and consolation. At least, that is the way it is told in story books. If the description is not literally true to life, it at least symbolizes the drama of regression. Advance and retreat are the campaigns of war, international or domestic.

When difficult problems face the adult, calling for the use of all his resources, the temptation is strong to fall back on the earlier reactions of childhood. Unable to face the grown-up situation in a grown-up way, the timid flee, the lazy shirk, the incompetent wonder what to do, and the irresponsible kick up their heels and have a good time. Regression to the infantile is not just a return to the childish; it is a return to the childish for the sake of accomplishing something by infantile means when the situation obviously demands adult intelligence.

A test of emotional maturity is the Willoughby EM Scale.¹ The rater may check the items as they apply to others or to himself. The reliability is slightly lower for self-rating. The scoring of the scale represents the pooled judgments of one hundred expert students of personality. EM is conceived as "freedom from egoistic or other infantile attachments."

III. IMPRESSIONABILITY OF MATTER

The basis of habit—and memory—is the impressionability of matter. Matter has the capacity to take impressions. Furthermore, the impressions are retained for

¹See R. R. Willoughby: *Willoughby EM Scale*. 1931.

a period of time. We can use analogies from everyday life. Fold a piece of paper and it will fold more readily along the same crease thereafter. Once a suit has wrinkled, it tends to fall into the same folds from then on. A sprained ankle is more apt to sprain again.

A. Perseveration. The tendency to repeat or continue an activity is termed *perseveration*. On his day off the postman takes a hike and the sailor heads for a gondola in the public garden. Once a catchy tune takes hold it is hard to shake. The refrain keeps "running through the head" with annoying persistence. When a teacher gives a pupil a certain grade at the beginning of the semester, a momentum involving inertia impels him to continue the same mark through the final examination.¹

B. Positive Adaptation. The threshold for a stimulus may be lowered by practice, or, in other words, impressionability may increase with training. "Because of practice, the lookout on board ship is able to signal the approach of a vessel more readily than the landsman who stands beside him. If the situation is such that we always get up when the alarm clock rings, the clock may be moved farther and farther from the bed on successive nights, until we are finally aroused by a sound much too faint to have gotten us out of bed on the first morning. A physician may develop a positive adaptation to the telephone at night, while his wife sleeps through the disturbance."² We can train ourselves to notice the events in which we are especially interested, as in positive adaptation, or we can train ourselves not to notice events which may detract from our dominant purposes, as in negative adaptation. The dominant interest may, in some cases, operate unconsciously to turn the effects of repetition toward higher impression-

¹I. Kendig and B. J. Shevach: "Studies in Perseveration, I," *The Journal of Psychology*, 1937, 3, 223-230.

²S. Smith and E. R. Guthrie: *General Psychology in Terms of Behavior*, pp. 76-77. By permission of D. Appleton-Century Company, Inc. 1921.

ability (positive adaptation) or lower impressionability (negative adaptation).

C. Negative Adaptation. If a subliminal stimulus is repeated with gradually increasing intensity, at intervals too long apart to induce summation, the response may not occur when the stimulus reaches or even passes the usual threshold point. Thus the impressionability may be decreased by adaptation, especially when fatigue is involved. If the temperature of a room falls gradually, we fail to notice it. The physician, through continued contact with sickness, becomes inured to the manifestations of suffering. If taxes rise by slow degrees, the increase in burden upon the citizen is imperceptible.

Experimentally, negative adaptation is brought about by so controlling the situation that the undesired response is absent, and the cue which has been responsible for it is present. There are three chief methods for securing such an end. First, the stimulus may be subliminal. Thus a person may lose his fear of cats by handling a kitten, or a child may be taken several times to the dentist just to ride up and down in the chair, preparatory to the first filling. Second, fatigue may be employed. Thus a rider may "break" a horse by sticking it out on the saddle until the animal is too exhausted to rebel any longer. Third, the undesired response may be inhibited by evoking a response incompatible with it. Thus an individual may get used to studying under noisy conditions by starting with a novel that is so exciting as to rule out the distracting effects of the environment.¹

Habitual risk-taking breeds careless contempt. Figures gathered by the Bureau of Labor Statistics confirm the popular belief that structural steel erectors have a perilous job. There can be no doubt that erecting a skyscraper is

¹See E. R. Guthrie: *The Psychology of Learning*, Chap. 5, "Inhibitory Conditioning." 1935.

dangerous work even with every possible precaution observed. The margin between life and death is small. A slip of the foot, a slight miscalculation of distance, a blow from a beam, and a man is plunging downward to destruction. But even with the hazards inseparably connected with the job, there is an outside factor making for accidents which increases the danger materially. It is the familiarity which breeds, if not contempt, a deadening of caution. Doing a dangerous thing as a matter of everyday routine soon causes the peril to fade into the background of the mind. It is simply impossible for anyone to concentrate his thoughts for hour after hour, day after day, on the same manual task, let it be as dangerous as it will.

Habituation makes it possible for man to endure some of the persistent annoyances of modern urban life. We get used to noises, smoky air, interruptions, bustling crowds, and bill collectors. As one views the monstrous conditions under which human beings live, one marvels at man's meekness and complacency. A salesman for air conditioning informs his prospective clients:

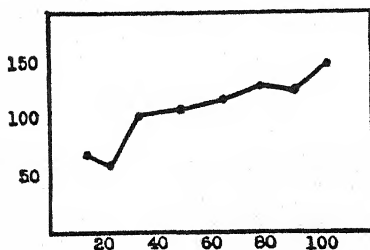
Every day we eat three pounds of food, drink four pounds of liquids and breathe 34 pounds of air. Perhaps some of us eat more than we should and drink things we shouldn't. The point is, we spend thousands of dollars and give a lot of thought to what we eat and drink. But to the one thing we consume the most of, we give never a thought.

The air we breathe in cities is heavy with soot and other foreign matter. In St. Louis, 600 tons of soot per square mile fall every month, and in Chicago 1430 tons. Boston air is relatively clean, but our monthly deposit must be at least 300 tons. This together with other impurities seeps into our homes and offices. All the air we breathe is charged with it. We wouldn't dream of eating bad food or drinking impure water, but we complacently breathe dirty air. Air conditioning corrects that situation. . . .

The argument sounds convincing, but it is likely to lose its efficacy in so far as the client has become negatively adapted to the horrible conditions described. The air is filthy, but what do we care?

D. The Learning Curve. The decreasing effectiveness of persistent repetition in the learning process indicates that the most efficient method for acquiring any skill involves the wise distribution of practice periods. If the beginner goes at his task too rapidly, he soon becomes stale. The rate of acquiring a skill may be represented by a learning curve. Learning curves vary for different individuals and for different sorts of material.

At certain stages in the learning process no further improvement is apparent. This stage is known as a plateau. The retarded progress may be partly due to fatigue, partly



LEARNING TYPESETTING

The vertical axis represents the amount of type set per hour. The horizontal axis represents the number of hours of practice.¹

to loss of interest ("going stale"), and partly to the limit of the method of procedure. A change in method, indeed, may mean slow progress for a while, during the time the person is mastering the new technique. In learning to typewrite, for example, the beginner first learns the keys for the separate letters. The

next step is to type, not in letters, but in words. Then a further stage is typing in phrases. And so on. Practice in each stage may show a rapid improvement at the beginning, known as positive initial acceleration, but later a limit is reached. Then a period of no progress or slow

¹C. M. Kelley and H. A. Carr: "Curve of Learning in Typesetting," *Journal of Experimental Psychology*, 1924, 7, 447-455.

progress may set in during which a new stage in execution is being mastered. As practice perfects the new mode of skill, a further improvement is achieved.

The acquisition of any habit may be represented by a curve which furnishes graphic evidence that practice must be distributed and new modes of procedure acquired, if the maximum proficiency is to be achieved.

IV. CHILD TRAINING

The modern emphasis on habit has aroused a widespread interest in child training as a part of the general program of mental hygiene. The nurture of a healthy personality in the child is the responsibility of those who mold the characters of the young through the technique they use in handling them.¹ The personality of the child may be loaded with neurotic traits, such as whining, rebelling, and flying into tantrums, or it may be blessed with healthy traits, such as thoughtfulness, kindness, and self-control, according to the wisdom of the guardians. The child must be socialized. He must learn to be responsive to the interests of others. Socialization is the main task of education.

Parents often do not take the bad habits of a child seriously, because they think the unfortunate modes of behavior will be laid aside as he grows older. Nothing could be more illusory. Children do not usually outgrow habits. The tendency is to grow into them.² Life is not divided into a series of independent eras. The child is, indeed, father to the man. The career of an individual is a total pattern, every incident in every stage of life contributing its bit to the mosaic of personality. Great care should be taken, therefore, to start the child wisely, and

¹S. Blanton and M. G. Blanton: *Child Guidance*. 1927.

²See D. Thom: *Everyday Problems of the Everyday Child*. 1927. Also *Child Management*. Revised edition, 1937.

to direct the course of his development with a view to its ultimate completion.

The idea of a career as a total pattern is an important one to keep in mind in the education of the new generation. Take, for example, the problem of obedience. Parental authority, to be effective, must be relentlessly insistent. Once rebellion is tolerated, the cause of discipline is lost. Yet the obedient child who is easy to manage may grow into the timid and obsequious sort of adult who is a social liability rather than an asset. Rigid authority must gradually give way to the maturing intelligence and initiative of the child. The child, too, deserves respect. His search for the independence of maturity should be wisely encouraged.

Another general principle in child guidance is to regard unfortunate habits as symptoms, the cure for which must be found in the underlying sources of the disorder. Thumb-sucking, for example, is a symptom of emotional maladjustment. If the feeding experience is incomplete in its satisfactions, either because of faulty physical equipment of the mother, inadequate milk supply, too rapid flow of milk, or, as in many cases, the more intangible negatives furnished the child by the mother's attitudes of unresponsiveness and rejection, a whole series of feeling tones of a more unsatisfying kind are prone to develop. In children who are deprived on either the physical or the emotional level, substitute pleasures develop. One of the most common is thumb-sucking. This behavior response is due to the child's need for finding a means of completing his cravings for pleasure, which are not being met in a more natural way.

Thumb-sucking treated by threats, punishment, or artificial restraint, is not cured. The parent who attacks the problem in this way is failing. The punishment or restraint to which the child is exposed only augments the

negative values already established and the consequent emotional damage that inevitably follows. In the nursing situation the mother satisfies the child's need for love as well as his hunger cravings. A denial of the breast before the child is ready to wean himself is liable to evoke unhappy reactions. There are satisfying ways of preparing the child for this next step in growing up. Since the sudden withdrawal of the breast is sometimes necessitated due to illness or sometimes to insufficient nutritive value of the milk or to loss of the supply, it is advisable to introduce the use of a bottle at least once a day from the beginning. In this way, the bottle is identified as a source of satisfaction at the same time as the breast, and, if the mother holds the child in the same relative position during the bottle feeding as at breast feeding, little negative value seems to be produced. The introduction of new and pleasing foods such as orange or prune juice by spoon feeding facilitates the further transition to more mature food habits. The pleasurable element of the taste would seem to offset the displeasure of the new reality. Taking the last few drops from the cup, if made an adventure by the mother's enthusiasm, helps to make the passage to the more grown-up levels with a minimum of dissatisfaction and conflict.¹

Habit clinics have been established in many of our towns and cities to advise parents in regard to the problems of child training. An expert staff, well versed in psychiatry, psychology, and social work, give physical and mental tests, upon the basis of which they lend their counsel.² It is often discovered that the parents of problem children need treatment as one important step in correcting bad habits in their young ones. *The Parents' Magazine* has

¹See Marion E. Kenworthy: "Social Maladjustments (Emotional) in the Intellectually Normal," *Mental Hygiene*, 1930, 14, 837-852.

²P. L. Schroeder: *Child Guidance Procedures*. 1937.

been developed to impart the wisdom of mental hygiene to puzzled elders, for the rearing of children involves many problems of emotional adjustment. The entire program of guidance is a recognition of the vital importance of correct habit formation.

Certainly the mental health of the child is just as important as his physical health. Parents have long been interested in the problems of physical hygiene, but it is only recently that due attention has been directed toward mental hygiene. Parents, somehow, resented advice as to how to bring up their children. Once at the close of a lecture before parents by Watson, a dear old lady arose and said, "Thank God, my children are grown—and that I had a chance to enjoy them before I met you."¹ The older attitude of antipathy toward mental hygiene, however, is changing to one of enthusiastic acceptance. As the awareness of problems becomes more vivid, an eagerness for scientific advice is growing, a good omen for the future.

How are habits formed? This question can best be answered by considering specific habits.

A. Some Specific Habits. 1. Eating. The obvious purpose of eating is to supply the fuel necessary for the bodily metabolism. The consumption of a meal is attended by many rituals which may engender bad habits.² The fundamental mistake committed by parents is the assumption that a certain amount of food must be consumed at every meal if health is to be maintained. Feeling it is the child's duty to eat, they coax and threaten him until an issue is made out of the situation. The child uses the opportunity to become the center of attention. Where the meal should be a matter of course, it becomes a drama.

¹J. B. Watson: *Psychological Care of Infant and Child*, p. 69. 1928.

²See A. Gesell: *Feeding Behavior of Infants*. 1937. See also F. H. Richardson: *Feeding Our Children*. 1937.

Parental indifference is essential to impress upon the child the routine nature of eating. He should not be scolded for failing to eat or praised for consuming the provender.

A child should be given every encouragement to form the proper eating habits. He should have his meals served in the dining room, if possible, or in the kitchen if there is not too much bustle or confusion around him. He should not eat in the playroom. He should not be allowed to bring his toys to the table. Furthermore, he should eat alone, instead of dining with adults who are privileged to indulge in items of diet denied to the younger members of the family.

Idling over the meal should not be tolerated. The child should be given a generous amount of time to finish his meal and then it should be removed without any words of reproach. No ill effects will be suffered from missing most of the meal or all of it. After being deprived of a meal or two, and being denied any sustenance between meals, hunger will become intense enough to insure the consumption of the following repast without protest.

Dawdling over the food may be a means of postponing a disagreeable task. Idling over the breakfast, for example, may be due to a distaste for school. Dawdling is a symptom, and the cause is to be found in a study of the child's whole routine. Wherever possible, therefore, mealtime should be followed by pleasant diversions which will furnish an incentive to eat without unnecessary "stalling."

Whims are readily developed in regard to certain foods, particularly vegetables. To cure the child of such caprices, the vegetables may be served first with the understanding that nothing else will be available until they are entirely consumed. If the child refuses to eat the vegetables, remove them and dismiss him from the table.

It is wise to serve the meal in courses, so that the child

is not compelled to face a task that seems overwhelming. Eating a little at a time, he does not become aware of how much he is storing away.

Warning should be given in advance of an approaching meal so that the child is given a fair opportunity to adjust his play activities accordingly. It is not fair to the child to issue an immediate call and to expect him to drop everything at once in response to the summons. His legitimate rights deserve respect.

2. *Sleeping.* Another important bit of child training is the formation of proper sleeping habits. As in the establishment of any habits, regularity is essential. The bedtime of the child should not be adjusted to the convenience of adults who may find that he interferes with their social life.

A child deserves a bedroom of his own where he can rest undisturbed. He should sleep alone. Parents are unwise who take their children into bed with them, as such a procedure encourages unhealthy fixations. Once a child refuses to go to sleep without the comforting presence of an adult and succeeds in getting his way, difficulties are in store for the parents. Elders must learn to steel themselves to the plaintive appeals of crying offspring who will use any excuse to summon aid.

Relaxation is a necessary preliminary to sleep. Coercion may make sleep impossible. The importance of the child's going to sleep is often overemphasized by adults. The afternoon nap may become a real problem, on this account. Since the important thing is rest, relaxation should be stressed. Before the child knows it, he will have dropped off into slumber. A person cannot make himself go to sleep and he cannot force sleep upon anybody else, either. Sleep is more apt to steal over one when one least expects it. When the proper conditions are set, that is, when a regular time is unequivocally insisted upon, when

comparative quiet is assured, and when a peaceful state of mind is encouraged, drowsiness soon ebbs into sleep.

3. Elimination. Control of the excretory functions is important not only for sanitary reasons, but also for its influence upon character. Discipline in these matters is one of the first lessons in self-control. The socializing of these functions is absolutely vital. The poor training given in this field is many times the cause of much trouble during not only the first five or even ten years of childhood, but also often in later life.

Regularity, again, is essential. Elimination can be conditioned by training to occur at definite intervals. The child should be left alone in the room so that no disturbances may interfere with the processes of excretion. A time limit should be followed.

Enuresis of a nocturnal order is often a serious problem. Bedwetting may be due to a number of factors. A very vital one is excitement. Playing strenuously after supper is likely to produce a state of tension conducive to enuresis.

The parental attitude is highly important. Too great a sense of shame is sometimes inculcated in the child. Wetting garments may become the basis of a profound inferiority complex, affecting the total personality. The shame attached to faulty elimination may lead to unfortunate psychological consequences more serious than any material damage that may be done. Training a child should proceed as objectively as house-breaking a dog. The principles of conditioning are the same in both cases. Clinical consultation may be very helpful to parents who face the problem of establishing proper habits of elimination in their children.

4. Sex. According to Watson, the love response is elicited by stroking the erogenous zones, such as the lips and the breasts. The infant child loves anyone who strokes and feeds it. There is no "instinctive" love of a

child for its parents. The child sees the mother's face when she pets him. Soon, the mere sight of her face, by conditioning, calls out the love response.

It is a harsh statement to assert that parental love is often very selfish. It is easy, for the sake of one's own pleasure, to love the child more than is good for him. Affection often interferes with the development of healthy habits in the young by preventing the objective attitude which is essential to sound training. A bachelor, therefore, may be the wisest counselor in matters of bringing up a child. At least, he has not been humbled by wayward offspring. Parents often love their children, not wisely, but too well. A nursery-school training may be necessary to offset the faults inculcated in the young by doting parents and relatives.

Parents fondle their children too much.¹ Let the parent kiss the child once on the forehead at night, if he must lose control of himself, and shake hands with him in the morning. It sounds absurd—it is certainly unsentimental—but many bad habits would be avoided if such a program were conscientiously followed. A caress is often an encouragement to the child to take advantage of the doting elder.

Parental love is dangerous because it fosters those nest habits of invalidism. "Bless its little heart" is the kind of babying that is not conducive to growing up. Marital relations, in later years, may suffer from such childhood nest habits, as "Mother's boy" demands the petting Mother gave him, and his wife demands the coddling Father gave her, neither of them being able to effect an adjustment on a mature level.

Another important aspect of sex training is the inculcation of a healthy attitude toward the sexual life. By evasions and lies, parents impress the child that love is

¹John B. Watson: "Should a Child Have More than One Mother?" *Liberty*, June 29, 1929.

something shameful. The untruthfulness of the stork story is soon discovered. Indeed, in later years, he will learn that the only truth in the story is the big bill. Children's curiosity and implicit faith should be met with frankness and truthfulness. No more need be told than is asked for, but what is revealed should be honest. Thus truthfulness will be encouraged in the child, and also an attitude toward sex that will make possible a happy love life when the mating period arrives. So much of our happiness depends on successful love that it does seem as if parents should give more attention to wise training in this direction.

5. Anger. Anger is evoked by hampering the infant's movements. Dressing the infant with modern clothes gives us almost a laboratory set-up for building in rage behavior. Temper is called out almost every time the infant is dressed, undressed, or changed.

Temper tantrums are often encouraged in a child by the poor example of a raging parent. Discipline should be imposed calmly but firmly. The parent who loses his temper and spansks a child viciously is liable to establish the same habits of rage in his victim. A youngster should in no case be granted a favor which he has sought by means of a tantrum. "Giving in" to appease him is merely building in a bad habit more firmly. See to it that he gains no ends through the tantrum. Make his rage highly unpleasant for him.

6. Fear. Fear is evoked in an infant by a loud noise or the sudden loss of support.¹ If Watson is correct in asserting that these are the only two stimuli occasioning fear in an infant, and if one pauses to consider the variety of stimuli of which adults are afraid, one will appreciate how much training has done to make people fearful. Children's fears are home grown. The parents do the

¹See the account of Watson's experiments on Albert, on pages 29-30.

emotional planting and the cultivating. There is good evidence to show that such early built-in fears last throughout the lifetime of the individual.

According to Watson, a child is not instinctively afraid of the dark. A loud noise in the dark, caused by a falling screen or a flying shade, will build in such a fear. Playing "bogy man" or frightening the child with stories of goblins will produce a fear of darkness. A trembling mother picking up a child during a thunderstorm and huddling in a corner in a terror-stricken attitude will cultivate a fear which may last throughout life.

Experimental data collected by English, Bregman, and others cast some doubt on Watson's findings. English tried to condition a fourteen-month-old child to fear a wooden duck. The conditioning failed because the loud noise produced by striking a large metal bar did not evoke a fear response, except for a slight startle, a blink, and a mildly worried look. At no time in the fifty trials was there a negative reaction to the toy. A month later the same child showed fear in response to a pair of shiny patent-leather shoes which appeared suddenly to her view. Apparently, the unexpectedness of the stimulus, catching her off her guard, provoked a fear response of withdrawal.¹

Bregman used an electric bell in attempting to condition infants to fear neutral objects such as wooden blocks and opera glasses. The sound of the bell did provoke a fear response, but the startle reaction could not be transferred to the blocks or glasses. Fear was established, however, for animals such as rats and caterpillars.

The demonstration by the Shermans that expert judges cannot agree in differentiating the various emotions by observing the reactions involved must be considered as a serious reflection upon the validity of Watson's con-

¹H. B. English: "Three Cases of the Conditioned Fear Response," *Journal of Abnormal and Social Psychology*, 1929, 24, 221-225.

clusions. If emotional behavior cannot be identified correctly, statements by Watson regarding fear may be derived from witnessing reactions actually expressive of anger.¹

Obviously, Watson's conclusions were too simplified to apply to all children in all kinds of situations. His findings must be qualified in the light of these more recent experiments. The essential importance of conditioning in the acquisition of emotional habits, nevertheless, remains as a fundamentally sound contribution to our understanding of the learning process.²

The stimulation of fear is useful in securing discipline. The method, however, is grossly abused. To train a child in the avoidance of an undesirable activity, a painful stimulus should be objectively applied immediately upon the commission of the deed, if the conditioning is to be effective. Waiting until Father gets home to inflict the punishment is poor psychology. It is practically impossible to condition a negative response where the painful stimulus is postponed. It would be ideal if tabooed objects could supply the punishment themselves. If a precious vase could provide an electric shock, thus rendering parental discipline unnecessary, the problem of training a child would be vastly simplified.

"Don't touch" is a frequent admonition directed at the child. Unfortunately a youngster is often warned to leave a harmful object alone, not because the object itself is dangerous, but merely because Mother or Father says so. Thus a child may avoid fire in order to please Mother whereas it would be wiser if he learned to avoid fire in order to escape physical harm. This point in the tech-

¹M. Sherman and I. C. Sherman: *The Process of Human Behavior*, Chap. 5, "The Observation of the Emotions." 1929.

²E. O. Bregman: "An Attempt to Modify the Emotional Attitudes of Infants by the Conditioned Response Technique," *Journal of Genetic Psychology*, 1934, 45, 169-198.

nique of training is stressed because adults often guide their conduct by what their parents once told them when they were children, instead of directing their activities in reference to the actual consequences of their deeds as observed from their own study of their own personal experiences.

B. General Principles. On the basis of our study of training we can formulate some general principles in accordance with which habits may be effectively formed or broken.¹

1. Forming Habits. *a. Get started immediately on the formation of the habit.* A person must seize the first opportunity to act on every resolution he makes and to capitalize on every emotional prompting he may experience in the direction of the habits he aspires to gain. The individual must not put off until tomorrow what he knows he should be doing today, as the habit of procrastination grows with practice, too. Evasion of a disagreeable task is paralyzing.

b. Fortify each resolution with as many efficient motives as possible. Training should begin with a strong initiative. All the possible circumstances should be organized to reënforce the right motives; such as making engagements incompatible with the old, or taking a public pledge, if the case allows. Thus the new beginning will be given such a momentum that the temptation to break down will not be likely to occur. Every moment of success contributes its increment to the establishment of the desirable habit.

Utilizing the technique of reward and punishment, the individual should concentrate on the pleasant consequences of his habit, fit it into the scheme of his interests, and remind himself constantly of the rewards of success.

An author found that he stalled in the morning to avoid writing. He would sit down after breakfast, light his pipe, and read the newspaper for several hours. Realizing that

¹See William James: *Principles of Psychology*, Vol. I, Chap. 4, "Habit." 1890.

his tendency toward procrastination was becoming seriously detrimental to his professional success, he decided to deny himself his pipe until he started work in the morning. His longing for a smoke encouraged him to begin his labors as soon as breakfast was over.

c. Never allow an exception to occur. Continuity of training is absolutely essential. If a parent wants his child to obey, he must see to it that the first command is heeded. Calling a child until the fifth time without getting a response establishes the habit of disobedience four times as firmly as the habit of obedience.

d. Distribute practice wisely. Repetition imbeds a habit most effectively if it is not carried out so continuously as to produce fatigue and staleness. Diversion by means of other compatible interests, in easing the grind, encourages the formation of the habit.

2. Breaking Habits.¹ Breaking a habit is a difficult task because it involves not only learning a new habit, but also unlearning an old one. For this reason, athletic coaches often prefer a greenhorn. A football star in high school acquired the habit of running back when he was circling an end. He was so fast that he could elude tacklers and make substantial gains. When he entered college, a brilliant football career was predicted for him. In faster circles, however, his old habit could not succeed; since he had run backward in carrying the ball for so many years, his coaches did not consider it worth their while to use him in the line-up, lest he score for the opposing team.

It is wise to learn a thing correctly in the first place. Then it will be as difficult to do it wrong as it is for a person who has learned it wrong to do it right. If a parent makes a practice of leaving a child's bedroom door open when

¹See L. W. Crafts, T. C. Schneirla, E. E. Robinson, and R. W. Gilbert: *Recent Experiments in Psychology*, Chap. 22, "Methods of Breaking Undesirable Habits." 1938.

he puts the youngster to bed, it will cause a disturbance if the door is closed some night. In reverse, if the child is trained to have the door closed, it is impossible to leave it open without incurring displeasure.

Attention should be directed upon the new habit. The less heed given the old habit, the better. A change in surroundings and a cultivation of new interests may prove effective in reducing one's thoughts about the old habit.

As a general policy in breaking an undesirable habit, it is wise to attack the problem with a definite suddenness. According to Confucius, "one conquers a bad habit more easily today than tomorrow." By plunging into the new program of conduct, a protracted struggle may be avoided. Success at the outset is imperative. It is well, therefore, to give the new habit every possible advantage. Abrupt acquisition of the new habit is the best way, if there be a real possibility of carrying it out; but we must be careful not to give the will so stiff a task as to insure its defeat at the very outset.

Several definite methods have been devised for breaking habits. One is repeating the habit itself. Dunlap has conducted some experiments to test the hypothesis that repetition may be employed in the dissolving of habits as well as in the formation of habits.¹ For example, he broke himself of typing "hte" by typing "hte" voluntarily throughout several practice periods, reminding himself meanwhile that this was a "word" that he would not write in the future unless he wrote it deliberately. Dunlap cured a number of stutterers by having them stutter on purpose. After they practiced stuttering voluntarily for some time, they had acquired enough control over their vocal apparatus to speak in a normal fashion.

Other methods of breaking a habit may be illustrated by

¹See Knight Dunlap: *Habits: Their Making and Unmaking*, Chap. 10, "The Breaking of Specific Bad Habits." 1932.

the curing of fears. One of these methods is carried out by the gradual reduction of the stimulus, or by the association of a pleasurable stimulus with the unpleasant one. If a child has been accustomed to sleep with a light on, he may be unconditioned or negatively adapted by dimming the light slightly each night. Done gradually, the habit is broken without creating alarm.

A child may be relieved of the fear of an object if the object is repeatedly presented in a pleasant situation.¹ A girl lost her fear of her bedroom, where she had experienced terrifying dreams, by working out a program with the guidance of a psychologist. She repainted her bedroom furniture and invited her chum to tea in the room. The association of pleasant times with the room removed the fear.

This technique was successfully employed by M. C. Jones in relieving a child of his fear of rabbits. A rabbit was shown at a distance while the child was enjoying a meal. The pleasure of eating made the sight of the rabbit pleasant. How, we may inquire, could the experimenter be sure that the fear of the rabbit would not condition a fear of the food? Such a possibility was averted by arranging the experiment so that the child would be hungry, the meal appetizing, and the rabbit held at a safe distance away. Thus, the pleasant reaction to the food was reinforced and the fear reaction to the rabbit was extinguished.² The food response was *dominant* in the situation.³

Thus, by repeating the fearful stimulus in a situation arranged to prevent the occurrence of the fear response, the fear reaction is gradually extinguished. Just as a

¹See M. C. Jones: "The Elimination of Children's Fears," *Journal of Experimental Psychology*, 1924, 7, 382-390. Also "The Conditioning of Children's Emotions," in *A Handbook of Child Psychology*, C. Murchison, Editor. 1931.

²M. C. Jones: "The Case of Peter," *Pedagogical Seminary*, 1924, 31, 308-318.

³For an explanation of dominance, refer to p. 310.

child will cease to open his mouth in response to a metronome beat associated with the offer of food, if the beat continues to occur without any sign of food, so the stimulus for fear may lose its potency under conditions unfavorable to the experience of fear. Pavlov called this technique experimental extinction. It is the basis of psychoanalytic therapy where catharsis (purging of emotion) is effected as the patient in the impersonal atmosphere of the analyst's consultation room lives through an earlier emotional experience without any emotional reaction. Negative adaptation is effected as the subject becomes desensitized to situations formerly functioning as stimuli adequate for the evocation of emotional response. By such means a mother relieved her child of a fear of the dark. The mother blindfolded the little girl and told her to guess by feeling with her fingers what objects there were on a table. Then the game was played in the dark without a blindfold. The child became desensitized or negatively adapted to the dark, as the threshold of stimulation for the emotion had been raised.

3. Reëducation. The replacement of bad habits with good habits, or the formation of new habits to replace habits which have been lost, is known as reëducation.

New habits must sometimes be developed to replace habits which have been lost. If a soldier has lost his right arm and he has been right-handed in his motor habits, he must be trained to perform with his left hand. Try stirring your coffee with your right hand, if you are right-handed, and notice how skillfully and readily you carry out the action. Then shift the spoon to the left hand and try to duplicate the graceful movements of the right hand. Unless you are ambidextrous, you will discover an awkwardness you would hardly believe possible. The degree of difficulty you experience is a proximate measure of the problem you would face if you had to make your adjust-

ments with your left hand. With the establishment of a proper mental attitude, the utilization of effective incentives, and the employment of a definite technique, many persons with handicaps, either physical or mental, are being reëducated to adapt themselves adequately to the tasks of daily life.¹

Frequently new habits must be established to replace faulty habits. Reëducation would be unnecessary, many times, if education had been wise in the beginning. Unfortunately, however, many of us acquire habits in our childhood which prevent successful adjustments in the adult stage. The adult may be unable to meet his problems happily without knowing the sources of his failure since they go back to forgotten experiences of childhood. The task of the psychiatrist is to unravel the career of his patient, to discover faulty conditionings in the early training, and then to recondition through the formation of healthy habits to supplant the old. Leaning too much upon others may have to be superseded by the development of independence and self-reliance. Reëducation reveals the situations out of which the unwholesome attitude originated, and then proceeds to build in a normal pattern of adult behavior.

One project in reëducation is the cure of the alcoholic habit. While alcoholism is an adult disorder, the basis for its genesis may go back to faulty habit training in childhood.

Alcoholism is a disease of immaturity, regardless of the actual age of the individual suffering from it. The drunkard is not only a child, but a spoiled child. He has far too keen a sensibility for likes and dislikes, chiefly the latter. By trying to avoid everything unpleasant, and to make what he cannot avoid artificially enjoyable, he reaches a state wherein he likes nothing

¹See S. I. Franz: *Nervous and Mental Reëducation*. 1924. See especially Chap. 3, "Mental Attitude and Incentive."

when sober. He must be reëducated in a manner that will show him that, while a diversity of interests is desirable, it is not necessary to like everything, nor is it possible to escape entirely from unpleasant duties.¹

The alcoholic must want to be cured for his own good. He must avoid occasions where wine, women, and song encourage drinking. He must avoid daydreaming about the joys of bygone parties, and, instead, concentrate his thoughts on the unhappy hangovers, the days of inefficiency at the office, and the sorrow that his indulgence has brought his family. The crux of the reëducation lies in the emphasis on positive thoughts of the benefits to be derived from abstinence. This general method applies to reëducation for any sort of habit.

V. THE RELATIONSHIPS BETWEEN HABITS

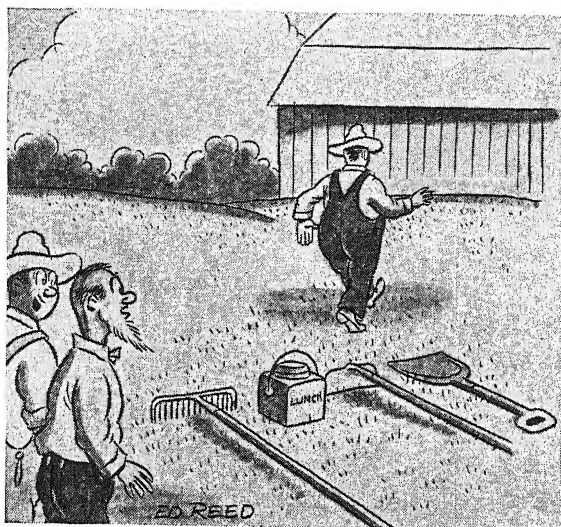
Will a habit established in one line of activity carry over to some other line of endeavor? This problem is the problem of transfer of training. The answer to it is not so simple as most persons believe, for it is very generally assumed that transfer is the usual thing. The question deserves a close examination.² Will the person who develops a habit of carelessness in translating his Latin assignment find that this habit will carry over to his mathematics where he may, for some reason, desire to be accurate? Educational policies have been based on the assumption that transfer invariably takes place. Football, for example, is advocated on the ground that the hard bodily contacts and the spirit of "do or die" teach the players lessons that are invaluable for enduring the hard knocks of life in the world of affairs. But will the

¹Richard R. Peabody: *The Common Sense of Drinking*. 1931. Reprinted by permission of Little, Brown & Co.

²For an excellent discussion of transfer of training, see J. M. Fletcher: *Psychology in Education*, Chap. 6, "Transfer of Training." 1934.

athlete who gives himself unflinchingly to the game on the playing field, devote himself with the same unsparing enthusiasm to his studies in the classroom? Probably, no!

Whether transfer will occur in any particular situation may be somewhat determined in the light of what we now



"My new hired man used to be a waiter."

What would happen if transfer would take place in a wholesale fashion.

(Courtesy of *The Register and Tribune Syndicate*, Des Moines, Iowa, and of the cartoonist, Mr. Ed Reed.)

know about the specificity of habits. It is customary to speak of a person as an honest or a dishonest man, implying that he is honest or dishonest, as the case may be, in all situations. We are all familiar with the fact, however, that a man who is scrupulously honest in his business may kick his ball out of a bad lie on a golf course. A child may cheat on the playground who would not think of cheating in the schoolroom. A person may eat with a foreigner in

the school lunchroom, but will draw the line on drinking a soda with him at the drugstore.

An investigation has been made of character organization which has shown that habits are ordinarily established to meet specific situations.

In proportion as situations are alike, conduct is correlated. In proportion as situations are unlike, conduct is uncorrelated. . . . Deception, helpfulness, coöperation, persistence, and inhibition were groups of specific habits rather than general traits. We found that, when situations involving the possibility of deception were almost identical, the behavior did not greatly vary from occasion to occasion. But when the situations permitting dishonesty were altered, as when one moves from a classroom to a party or an athletic contest or has the opportunity to steal money rather than to copy the answers of a test from an answer sheet, then there was considerable alteration in the practice of deception. As the situations became less and less alike there was found greater and greater diversity of behavior, so that one could not predict from what a person did in one situation what he would do in a different situation. . . . A child does not have a uniform generalized code of morals but varies his opinions to suit the situations in which he finds himself. . . . Knowledge of right and wrong is a specific matter to be applied to specific situations which the child encounters in his daily living. . . . There seem to be different codes for different situations, that is, a home code, a school code, a Sunday-school code, a club code.¹

Thus, an individual personality may be made up of unintegrated habits where the element of transfer is negligible, as is so well illustrated in the insane person who may talk intelligently on some topics and rant on others. The child who brings home a report card with an A in deportment may be an unmanageable rascal in the family group. The gasoline station attendant who demonstrates remarkable courtesy in asking after the oil may

¹From H. Hartshorne, M. A. May, and Frank K. Shuttlesworth: *Studies in the Organization of Character*, pp. 373, 1, 108, 105. 1930. By permission of The Macmillan Company, publishers.

be very rude to the grocer at the store. A man may exercise critical judgment in matters scientific and be gullible in matters religious.

Habits are apt to be relatively specific unless certain conditions are present that are conducive to transfer of training. Transfer does occur in some instances because there are identical elements present to encourage an integration. Long before Ann Harding became an actress she aspired to be a business woman, and her first job was as typist and file clerk for a life insurance company at \$12.50 a week. Her zeal and ability soon raised her to a responsible position, where, instead of taking dictation, she dictated her own letters into a dictaphone. It was not long before she found that her letters were coming back to her badly typed—obviously the work of inexperienced girls. She found out that the best typists claimed the best dictaphone records, and that hers did not rank in that category. At once she set to work to perfect her voice and enunciation—to space her words correctly, to accent the important syllables, and to speak with distinctness. What she learned from this has been of inestimable value to her in her stage and talking-picture career.

The appreciation of general principles may facilitate transfer from one illustrative case to another. A student manager of a college hockey team was outstanding in the efficiency with which he discharged his managerial functions. In fact, he was so thorough as to lead the observer to wonder if there were not some peculiar reason to account for his untiring industry. When he was asked to account for the enthusiasm about his work, he explained that he looked upon his managership as a real opportunity to prepare himself for business. Indeed, training as a student manager will undoubtedly benefit him in business, because he saw the relationship between his college activity and his prospective business career. Through such organization of

experience, one habit may reinforce another to good effect.

Whether transfer will occur or not depends to an important extent upon the individual. If he is intelligent enough to recognize relationships, if he uses techniques that are especially designed to carry over experience from one set of circumstances to another, and if he makes definite efforts to connect the various situations to which his training can be applied, then transfer is facilitated. Thus Ruediger found that pupils trained to be neat in their written work at school improved also in the neatness of their dress and the care of their rooms at home *when* neatness was inculcated as an ideal applicable to many realms of experience.¹ If such an emphasis upon the ideal of neatness is lacking, transfer fails to occur, as Squire showed when he discovered that training pupils to be neat on their arithmetic papers did not make them neat on their language and spelling papers.² Johnson demonstrated that definite training in logical thinking, with stress on the value of learning how to reason logically, may result in improvement in the solution of geometric problems.³ As Judd has asserted, conscious ideals will help the learner to establish general modes of thought and action. In setting up generalization as the goal of education, Judd states that "mental development consists . . . in equipping the individual with the power to think abstractedly and to form general ideas. When the ends thus described are attained, transfer of training . . . has taken place because it is the very nature of generalization and abstraction that they extend beyond the particular experiences in which they originate."⁴

¹W. C. Ruediger: "Indirect Improvement of Mental Functions through Ideals," *Educational Review*, 1908, 36, 363-371.

²See W. C. Bagley: *The Educational Process*, p. 208. 1916.

³E. P. Johnson: "Teaching Pupils the Conscious Use of the Techniques of Thinking," *Mathematics Teacher*, 1924, 17, 191-201.

⁴C. H. Judd: *Psychology of Secondary Education*, p. 441. 1927.

Further discussion of transfer will follow in the chapter on intelligence.

VI. CHARACTERISTICS OF HABITUAL ACTION

There are four characteristics of habitual action which are worthy of mention: propensity, facility, automaticity, and inertia.

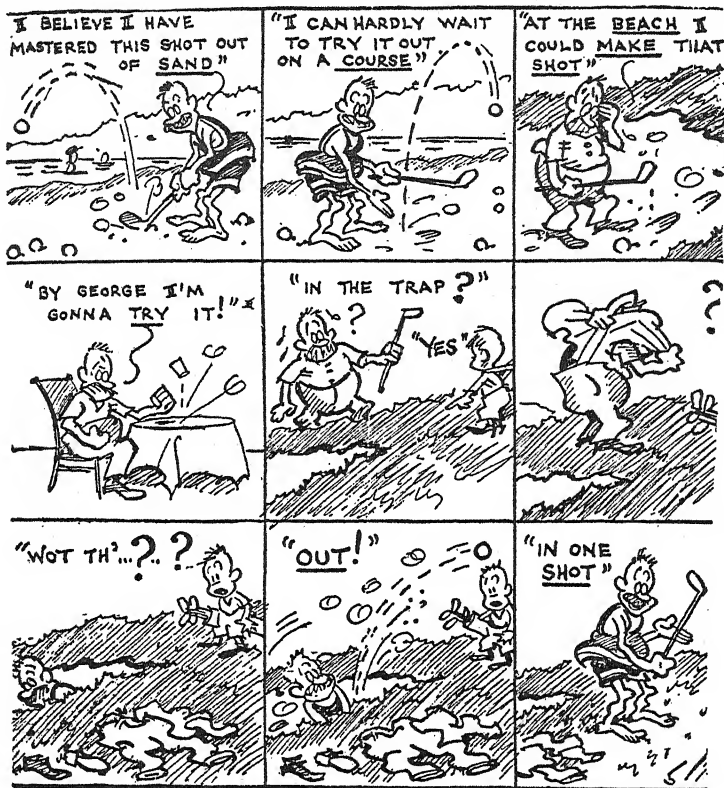
A. Propensity. In a specific situation a person is prone to do what he has done in that specific situation before.

The propensity of habitual action may be described more exactly in terms of the principle of partial identity: "Any part of a situation which causes a definite act may later call forth the same response either in whole or in part."¹ For example, a person may go to his bedroom to dress for dinner, take off his clothes, and retire, only to wonder, suddenly, how he was going to get to sleep in broad daylight.

B. Facility. Habit simplifies the movements required to achieve a given result, makes them more accurate, and diminishes fatigue. The practiced adept proceeds surely and rapidly, while the learner continually takes false steps which he must retrace in a bungling manner. Practice facilitates performance.

The beginner on a piano is very unsure of himself, even when he plays with one hand. He can never be certain he will strike the key he is aiming at. When it comes to playing with both hands, he is as a man confronted with a dilemma, not knowing what to do. After years of practice, the same person may play over the keys readily and accurately with little or no effort. Language habits follow the same principle. A person who has been reared in an English-speaking country, finds it very difficult to under-

¹J. R. Butler: *Human Nature: A Guide to Its Understanding*, p. 16. 1933.
See also the principle of reintegration as expounded by H. L. Hollingworth: *Psychology: Its Facts and Principles*. 1928.



"GOLFER WILL TRY ANYTHING"

(Drawn by Fontaine Fox.)

stand spoken German, no matter how thoroughly he has mastered the vocabulary.

Applying the principle of partial identity, it is clear that a uniform manner of performing an act facilitates the execution of that act, for when the conditions recur in the customary fashion, the response regularly called out by that particular situation is the more readily evoked.

Writing is performed with more facility if it is always carried out according to standard conditions. A news-

paperman, at a rickety typewriter in the tobacco-stained corner of a hurly-burly newspaper office, turned out copy that made his name famous among editors. At the request of a magazine he wrote a story, working it out after hours on the same old typewriter in the same old corner. The story was such a success that it made him wealthy. His affluence gave him a chance to realize his life's dream, an elegant office, beautifully decorated and luxuriously outfitted, where bay windows afforded him a restful view. When the office was finished and a gleaming new typewriter shone upon a magnificent desk, he sat down to write. He sat, and he sat some more. His mind remained barren of ideas. After more fruitless attempts to create something literary, he gave up in desperation, locked the place up, and returned to his old folksy corner in the newspaper office, where he dropped into the old chair, and where, in the midst of the old bustling confusion, he recovered the old inspiration. Things were all right again.

C. Automaticity. An habitual action tends to become automatic, that is, to take place independently of attention.

Few people can tell which shoe is put on first in the morning because the act is so habitual as to require no attention. Skill in any activity depends upon practice that is continued until the exact movements can be executed unconsciously. When consciousness is applied to an activity which has become automatic, the interference is disastrous.¹

The centipede was happy quite,
Until the frog for fun,
Said "Pray, which leg comes after which?"
Which wrought his mind to such a pitch,
He lay distracted in a ditch,
Considering how to run.

¹For the effect of consciousness upon golfing skill, see Tommy Armour: "Leave Your Brains at Home," *Collier's*, September 26, 1936.

When a person pauses to wonder how a familiar word is spelled, he plunges himself into confusion. Is it b-e-l-i-e-v-e, or is it b-e-l-e-i-v-e? A person who knows the Lord's Prayer by heart may not even remember how it begins if he is suddenly called upon to lead in prayer, and is thereby compelled to think hard on the initial phrase.

Sleep and digestion are habits which proceed most efficiently when least thought is given to them. Insomnia and dyspepsia may be the consequences of unwanted attention.

Habits are performed unconsciously. Biting the nails, coughing, or putting the hands in the pockets may develop without the person's being aware at all that he is doing such things. A nervous chuckle may become so automatic as to escape the chuckler entirely.

The unconscious nature of habit is a significant psychological fact. It means that much of our behavior is motivated by factors of which we are unaware. The training of infancy has produced its effects upon our habit systems without leaving any explicit memories.

A large part of our world is never described in words. No names are given to many of our responses which, therefore, remain un verbalized. Many people cannot describe how they do certain things—their word-world does not correspond to their object-world. The activities of the unstriped muscles and glands, the goings-on in our bodies, are un verbalized.

[The world of infancy] is totally un verbalized for the first year and remains practically un verbalized until the end of the second year. This is the period when many thousands of reactions are built in, both manual and emotional. . . .

May we not say that the *un verbalized* of the behaviorist is a scientific substitute for the unconscious of the psychoanalyst.¹

¹J. B. Watson: "The Myth of the Unconscious," *Harper's Magazine*, September, 1927.

The automaticity of habit is an important feature in mental economy. By relegating much of our activity to unconscious direction, the mind is left free to concentrate on the improvement of its adjustments and on the extension of experience into new fields. "We must make automatic and habitual, as early as possible, as many useful actions as we can. . . . The more of the details of our daily life we can hand over to the effortless custody of automatism, the more our higher powers of mind will be set free for their own proper work. There is no more miserable human being than one in whom nothing is habitual but indecision, and for whom the lighting of every cigar, the drinking of every cup, the time of rising and going to bed every day, and the beginning of every bit of work, are subjects of express volitional deliberation. Full half the time of such a man goes to the deciding, or regretting, of matters which ought to be so ingrained in him as practically not to exist for his consciousness at all."¹ Unfortunately, habit works against us as well as for us, since bad habits can become second nature as readily as good ones.

D. Inertia. Once an action has been thoroughly ingrained by long practice, it tends to persist in the same form (perseveration), even though the environment which first evoked the response may have changed radically in the meantime. Habit is the basis of custom, the inertia of which is notorious. People in modern times cling to the modes of action established by their ancestors ages ago. Thus the American policy of isolation which prevailed in pioneer America at a period when the United States was comparatively cut off from the rest of the world is still advocated by patriotic citizens who are apparently unaware that the situation has undergone a revolutionary

¹William James: *Principles of Psychology*, I, p. 122. 1890. By permission of Henry Holt and Company.

transformation since the days of George Washington. It is highly absurd to insist that our country remain aloof from the affairs of other nations, when, economically and otherwise, our own welfare is intimately dependent upon the prosperity of foreign lands. Yet isolationism dies hard, so strong is the pull of custom. Many customs, of course, are still useful in our day. We tend, however, to retain the customary ways of doing things, whether or not they fit our present needs.

Similarly, the habits formed in childhood persist into adulthood, often causing serious maladjustment. The inertia of habit is thus responsible for the arrest of development technically referred to as fixation. A child who is trained in the habit of obedience may become a docile, spineless adult who "has no mind of his own." The intelligent person takes an inventory of his habits at various stages of his growth and discards those which interfere with mature adjustments. Overcoming the inertia involved in reëducation requires considerable effort, and most people prefer to cling to the good old ways, no matter what the cost, rather than to go through the painful process of thinking things through for themselves. Social pressure, indeed, is very powerful in "keeping us in line." Conformity is usually the easiest way out. The desire for approval and the fear of disapproval combine, with a host of other factors, to encourage the inertia which comes so naturally to us. Habit, said James, is the flywheel of society. It insures the standardization which seems so necessary for social stability.

SUMMARY

Nature and nurture are both significant in the evolution of the individual. It is difficult to distinguish the respective influences of heredity and training since maturation complicates the situation so seriously. Investigations

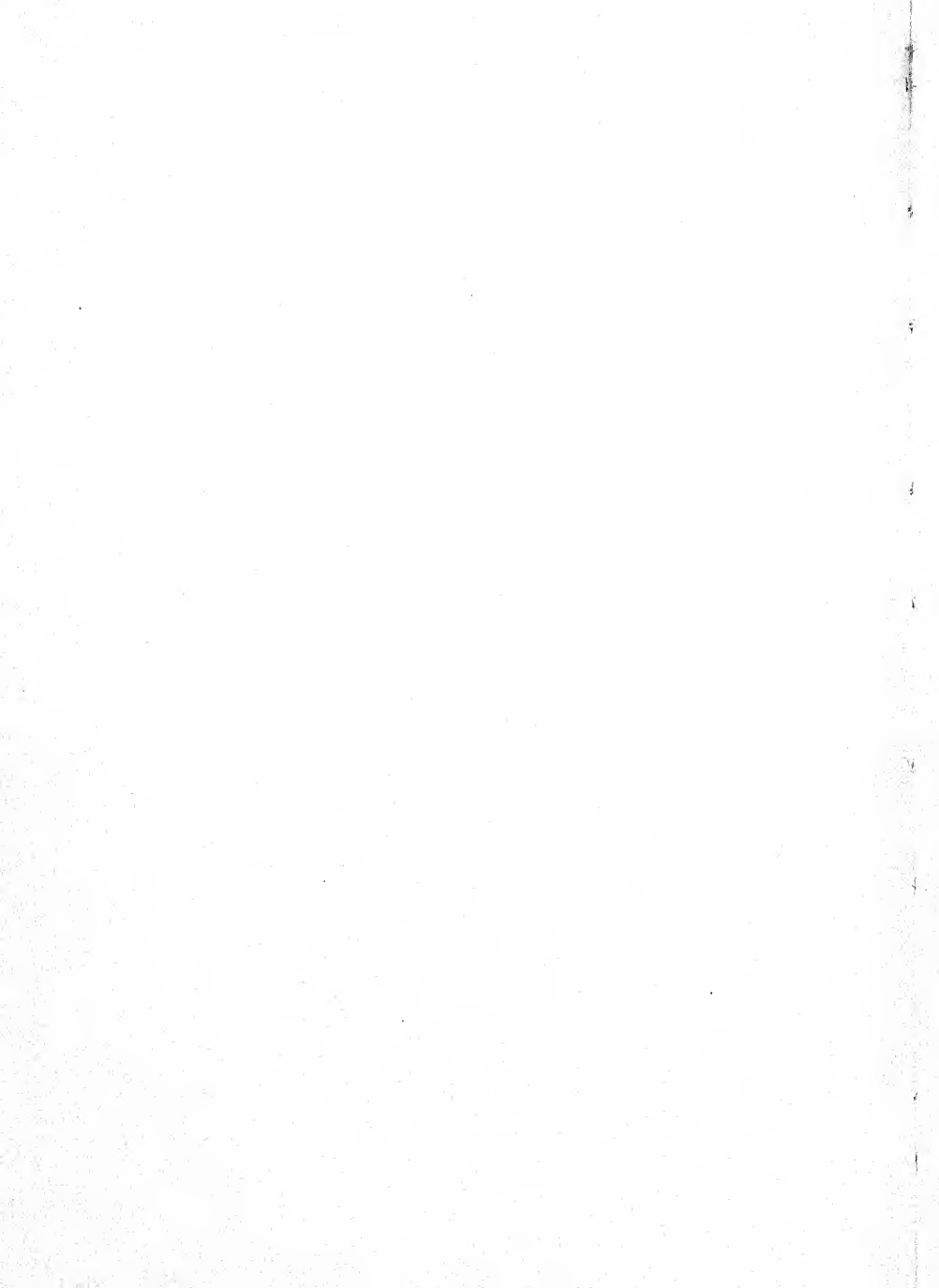
using co-twin control and foster children have shed important light on the problem.

Habits are formed through conditioning, as activities become automatized through repetition. Tendencies once started tend to persevere. The threshold of stimulation may be reduced by positive adaptation or raised by negative adaptation. Learning progresses in an uneven fashion as interest and changing techniques affect advance.

Mental hygiene provides valuable principles for building in the proper habits and for breaking bad habits.

Habits are acquired as specific responses to specific situations unless some efforts be made to generalize them.

A person is inclined, in a certain situation, to do what he has done in that situation before. He develops certain set ways of doing things. These activities are facilitated if the conditions remain constant enough to make him "feel at home." Once an activity has become automatic, it functions better without conscious regulation. Habitual modes of reaction become second nature to us through long practice. As time goes on, we become more and more attached to these familiar patterns of conduct.



PART IV
EFFECTIVE ADAPTATION

In Part IV we shall see how the mind functions in securing successful adaptation to environmental and personal demands. Chapter 9 will describe how the individual ascertains exactly what is going on about him, through "Attending and Perceiving." Chapter 10 will explain how the past is used in the anticipation of the future, through "Remembering and Anticipating." Chapter 11 will analyze the "Thinking" process through which the individual reasons his way to the beliefs that eventuate in action. Chapter 12 will seek to discover what is meant by intelligence, by an investigation of "Intelligent Adjustment."

ATTENDING AND PERCEIVING

WE NOTED in Chapter 3 the role of the receptors in the accurate detection of stimuli. In the present chapter the processes through which the individual becomes aware of events will be studied with more emphasis upon their psychological nature. Briefly, something is vaguely sensed, it is attended to, it is clearly perceived, and a response is made.

I. ACCURATE ADJUSTMENT

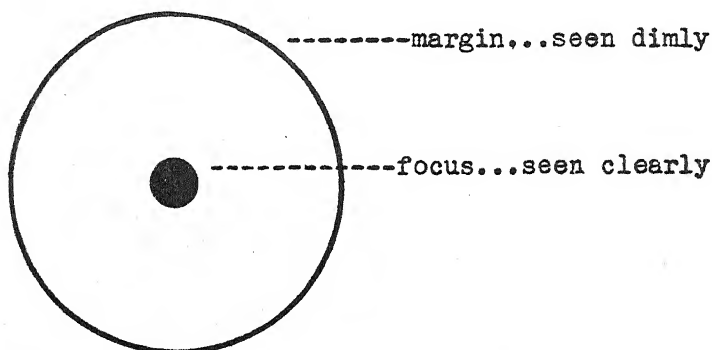
Attending is the process through which the individual responds in a differentiating manner to his environment. Responses are made to particular stimuli that are selected from the host of situations confronting him. When a person attends, he assumes a set which points his reactions in a definite direction. This sort of selective response facilitates more accurate adjustment.

As you are reading this passage, a man may be whistling on the street outside, or your clock may be ticking on your mantelpiece. If you are attending to this page, the experience of its contents will be more distinct to you than the waves propagated by the whistler or the clock. If the musical passerby should fire a gun, you would immediately cease to give heed to this discussion.

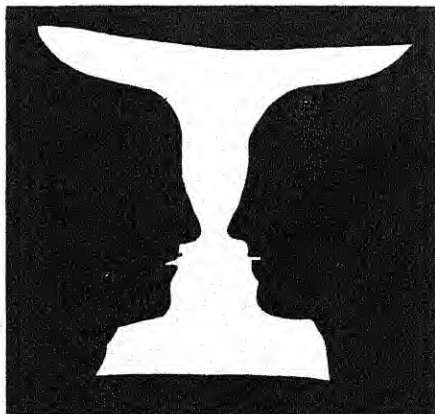
The phenomenon just mentioned may be described in various ways. One is to state that your experience varies in its degrees of clearness.¹ The page may be clearer than

¹E. B. Titchener: *Lectures on the Elementary Psychology of Feeling and Attention*. 1908.

the whistling or vice versa. Another is to explain it in terms of levels of consciousness, one stimulus being perceived on the conscious level, the other on the subconscious



level. Another mode of description is in terms of focus and margin, in which the field of consciousness is conceived on the analogy of the visual field. You see clearly what you are looking at directly, and less clearly the stimuli on the periphery. Experience is comparable to a flashlight which illumines most brilliantly the object at which it points, fading on the fringes into darkness. Still another way to describe the same experience is by figure and ground. Holding the illustration at arm's length, what do you see?¹ You may see two profiles or a vase, depending on whether you take the



¹From E. Rubin: *Visuell wahrgenommene Figuren*. 1921.

black as the figure and the white as the ground (background), or vice versa. The figure is clearer than the ground. You may see, also, the fat man at the bottom, balancing a bowl on top of his hat.

Viewed behavioristically, attending consists in wrinkling the brows, squinting the eyes, inhibiting movement, checking respiration, and executing an adequate motor response. Smell smoke? Sniff-sniff—run for the extinguisher.

Attending is a matter of interest. We give heed to the things that appeal to our emotional needs. Will power may also be considered as a driving interest.

I am a girl 16 years of age, in my third year in high school, and preparing for college. Recently I have found that it is very difficult for me to apply myself to my studies. I keep putting off studying until the last minute, and I realize that while I have not fallen down on my work as yet, I shall do so unless I apply myself more steadily. I frequently make a resolution to study hard, but the resolution is always broken, for I cannot drive my mind where I want it to go. . . . My question is how can I force myself to work first and play afterward.¹

She cannot drive her mind, she says, where she wants it to go. The explanation for her failure is that she does not want her mind to go to her studies, though she is trying hard to persuade herself that she does. If she were interested in her studies, the problem would readily be solved. If, for example, she were wholly dependent upon her own efforts for her livelihood, and if she were studying law with the success of her legal career hanging upon her school record, the motivation would be strong enough to overcome her inertia. Probably she would be wise to give up pining for a college education which she does not really crave.

"I cannot pay attention" is a frequent complaint. It

¹From a question asked of Dr. Cadman.

is, however, psychologically fallacious, since the individual actually can pay attention—to the wrong things. Attention is pointed in the direction of our interests.

II. SET

Below is a diagram.¹ Study the locations of the numbers on the left-hand chart for thirty seconds. Cover the chart. Fill in the numbers on the right-hand chart in

B			8		N
	0	42		0	333
6	△	S	D		□
		N	T	19	4
7	0		#	0	
L	X	74	5	)(	N

their proper locations. Now fill in anything else on this chart which you can remember. Uncover the original chart, and check your performance. How many numbers did you locate correctly?

Did you notice the words?

B N
 O O
 SD
 NT
 O O
 L N

If you carried out the initial instructions, you should have located the numbers more accurately than the letters or miscellaneous figures on the chart. If you did not do what you were told, your behavior is a reflection on your intelligence.

¹Borrowed, with modifications, from an experiment by Külpe.

A. **Selectivity.** The superior accuracy in locating the numbers on the chart indicates that we perceive more clearly the stimuli to which we attend. The experiment also demonstrates that the set determines the direction of attention. The bias, attitude, or interest is the determining tendency. We report best on what we are set for.

We notice what we are interested in. A man may never bother to read the stock-market page in the newspaper until he entrusts his funds to Wall Street. A person who travels brings back those impressions which particularly struck his fancy during his tour.

THE ROMANCE OF THE SEA

"Sailor," said I, to the sun-browed lad
With the mariner's rolling gait,
"What glorious cruises you must have had
From Oporto to Bering Strait!
You have seen the flying fish skim the foam
Where the Gulf Stream rippled blue,
And the cachelots spout in the darkling gloam
(As I've read that they often do.)
Tell me of every thrilling cruise,
Talk of the life you've led—"
"The movies was good down to Newport News—
None better," the sailor said.

"But, sailor," I cried, "you have seen whole fleets
Of the Portuguese men-o'-war,
You have heard the whine of the brine-wet sheets
As you beat off a leeward shore;
You have cleft a track through the green sea moss
While it clung to your rusty prow;
You have glimpsed the gleam of the Southern Cross
As it rose on the starboard bow.
From Pe Chi Li to Matanzas Bay
You have breasted the rolling tide—"
"There's plenty o' hooch down Havana way—
Swell licker," the tar replied.

"But what of the equatorial sun
To the sou'-sou'-west of Spain,
And the desperate time when the spindrift spun
In the terrible hurricane?
What of the calms, when you tossed for days,
With never a breath of breeze,
And nothing at all to attract the gaze
But a desert of empty seas?
You have dropped your anchor in bights and sounds
From Brest to Van Dieman's Land—"
"I seen Babe Ruth at the Polo Grounds,"
Said the sailor; "the blighter fanned."¹

Cancellation tests may be used to measure attentive capacity. The subject is instructed to mark out, with maximum speed and accuracy, certain designated recurring items on a page of material. If the time-limit method is employed, the score will be the number of items correctly crossed out within a given time, usually two minutes; if the work-limit method is used, the score will be the time necessary to complete the list plus a penalty of one or more seconds for each item omitted. Various kinds of material are available. One form of cancellation test consists of a series of letters printed in random sequence. The task is to cross out the letter "a." Other tests consist of digits or geometrical forms. Münsterberg used a newspaper page in testing telephone operators, requiring them to cross out a certain letter. Perception and speed of movement are involved in the process of selecting the specified items and cancelling them.

Another measure of attention is card sorting. Link devised such a test in which forty-nine cards were employed, each card bearing from seven to twelve letters. Twenty of the forty-nine cards contained the letter "O." The subject was instructed to sort the cards into two piles, placing in one pile the cards containing the letter "O"

¹James J. Montague, in the *Boston Globe*, June 28, 1921.

and in the other pile the cards not containing the letter "O." His test results correlated .55 with skill in inspecting shells, a vocation demanding quick movement and rapid hand-eye coordination.¹

Since the range of attention is limited, attending must inevitably be selective, like the magnet which picks the nails out of the sawdust. Attending to one thing means diverting attention from another. In looking at a jigsaw puzzle the design of the cutting is not apparent when the puzzle is picture side up; indeed, it is practically impossible to select out the cutting design. If the puzzle is turned over on the reverse side, the clear prominence of the cutting design is very striking.

Selection is in accordance with the dominant interests. On a cold day during the war, a soldier lay down under a booming cannon for a nap. He slept soundly, undisturbed by the explosions. His major happened along. "Jones, get up. What's the matter with you?" he ordered in a firm but quiet tone. Jones immediately awoke. Thus a mother trained in both negative and positive adaptation will sleep through the noise of traffic but will be awakened instantly by her infant's cry—while Daddy may continue to sleep on and on. The prospective bride notices china-ware, mops, garbage pails, and ice boxes in the store windows she had often passed before without heed. Go through a book you read two years ago, and see how you discover statements you had not even noted in a previous perusal. New interests acquired during the interval set you to notice with a new selectivity.

Concentration requires a set for concentration. This set is a matter of interest. Voluntary attention² is often painful because distracting stimuli have more appeal.

¹See H. C. Link: *Employment Psychology*, p. 39. 1920.

²Attention is sometimes involuntary. A loud clap of thunder catches your attention even though you prefer to ignore it.

The passing fire-engine is more enticing than the psychology lesson. "Taking pains" requires a strong interest for its sustenance. Every motive should be utilized to intensify the interest in concentrating, and habit will facilitate the process of concentrating if the individual is interested enough to keep at the struggle without weakening. It is easy to become scatterbrained, because one's attention has a mischievous tendency to wander at the slightest provocation.

B. Catching Attention. Certain sorts of stimuli or situations catch the attention because they appeal to fundamental human interests. It is important for us to adjust ourselves to such situations. A study of the means of attracting attention is of vital importance for advertisers and public speakers. What sorts of things get the attention?

1. Intensity. A very bright light or a hard slap on a sunburned shoulder catches the attention. A deeper analysis of the situation reveals the fact that it is a change in intensity which has attentional value. A man who works in a boiler factory gets so used to the noise that he no longer notices it (negative adaptation). If the clatter should suddenly subside, he would immediately give heed, just as a person does not notice the ticking of the clock until it stops ticking, or as the sleeper wakes up when the parson stops preaching. There is a baffling of expectation. In his story *Silence*, Leonid Andreyev writes:

There is a difference between silence and stillness. Stillness is the absence of sound; silence is that quietness in which it seems as though someone should speak but will not. . . . He caught himself listening to the silence of the house . . . it almost seemed that he heard silence.

Employing the change of intensity, electrical advertising is most effective if bright and dim lighting are alternated, or if the lights go on and off.

2. *Duration.* A stimulus which is not noticed at first will catch the attention if it lasts for a while. A faint sound continued will eventually be heard, due to the summation effect.

Adaptation cancels the effects of protracted duration. If a stimulus does not at first get the attention, it continues until it succeeds in attracting notice, and then adaptation sets in, so that after a while no further heed is given to it.

3. *Repetition.* Repetition is intermittent duration. A stimulus which escapes attention at first ultimately is attended to if it is repeated. For this reason, the doorbell is rung and rung until something happens. An effective teacher repeats his remarks until the student "comes to" enough to listen. Advertisers must consider the frequency of the appearance of their advertisements as it bears upon the efficiency of the influence upon the prospective buyer. Too frequent repetition is diminished in its effects by negative adaptation. "By special permission of the copyright owners" aims to protect a song from being "killed" by superfluous radio broadcasting.

4. *Suddenness.* An abrupt change removes the effects of adaptation. Suddenness is particularly effective when there is a shift from one sense organ to another. I was watching a movie thriller, years ago, on the day before the Fourth of July. The hero was chasing the villain, brandishing a revolver, and waiting for a chance to aim and fire. Just as the hero rounded a corner and gained an opportunity for a clear shot, the boy in the seat behind me fired his cap pistol. My response was not only auditory, but was also kinesthetic. The shift from a visual to an auditory stimulus provoked in me a decided kinesthetic response.

5. *Size.* Big billboards, large electric signs, and full-page advertisements catch the attention. Again, upon further analysis, we discover that it is a matter of relative

size. A skinny man would stand out at a Fat Man's Convention.

Size, as a condition of attention, follows the principle of diminishing returns. A full-page advertisement is more effective than a half-page but not twice as effective.¹ Starch found that a two-page advertisement, instead of having 200 per cent, or twice the attention value of a full-page, had only 158 per cent of the value of a full-page.²

6. *Quality.* A pretty girl has attentional value.

Styles have changed, the advertising pages are no longer what they used to be, and the day is gone when the only proper way to announce a new model of a motor car is to print a diagram of the engine and a bill of particulars as to piston displacement and ignition. The modern way to announce a new model of a motor car is to print a picture of it with two bathing beauties climbing into the back seat from the running board. . . .

This is a new day, and the advertising pages have ceased to be a mere album of things which can be purchased—a portfolio of stoves and dishpans, needlework and linen, hardware and upholstery—and have acquired some of the glamour of the Winter Garden. From the sheer emphasis on black chiffon it is difficult to tell, in many instances, whether the young lady who has disrobed before the camera has consented to do so in behalf of stockings, garters, underwear, shoes, the rug on which she stands, the pillow at her feet, the chair on which she leans, the bracelets on her arms, or the grand piano in the background. Only close examination of the floor beneath the rug may reveal the fact that it is a floor advertisement, not a Follies poster, and that the message which this picture carries is the good news of a wax that will not scuff with wear or blister with hot coffee.

One thing is certain. A new theme is being introduced into the technique of commercial art, and the business of selling shoes and clothes and household goods has acquired a new method. What is a dye that will not fade without somebody in a bathing suit to test it? What is a copper pipe that will not leak, a window screen that will not rust, or a laundry soap that

¹See J. G. Jenkins: *Psychology in Business and Industry: An Introduction to Psychotechnique*, p. 279. 1935.

²D. Starch: *Principles of Advertising*, p. 560. 1923.

will not streak, without somebody fresh from the seashore to admire it? . . .

Call this commercialism, if you like. Call it an attempt to appropriate charm for a soap or a sofa or a sport coupé by associating it with the symmetry of perfect form. But for years critics of the American system have been bewailing the fact that American utilitarianism is divorced from art. We have turned a corner.

Business has discovered beauty.¹

7. Movement. Moving objects are more apt to catch the attention than stationary ones. Many electric signs involve motion. The traffic officer may not be seen until he moves. The surveyor has his assistant wiggle the marker so that it may be more readily sighted through the telescope. The golfer who dubs his drive lays the blame on a fellow player who moved just as the remarkable shot was about to be demonstrated. Suzanne Lenglen in her book, *The Love Game*, said that it is easier to hit a moving ball than a still one. If she were right, the canny golfer should have a caddy roll a ball across the tee or throw it at him from a pitcher's box in front, while he takes a vicious swing at it in passage; it should be easier to kill a fly in motion.

The truth is, it is not easier to hit a moving ball. The fallacy in the above discussion is the assumption that the player's attention must be attracted. The golfer on the tee is looking at his ball—he is already attending. If a spectator moves, his attention is diverted to the moving person, away from the stationary ball. After the drive has been sliced to the rough, the search begins. The ball is stationary so that it does not attract the player's attention, a very different situation from that on the tee where he already knew where the ball was. If a golf ball could be invented which would jump up and down in the rough

¹Charles Merz: *The Great American Band Wagon*, pp. 147-149. 1928. By permission of the John Day Company.

until it attracted notice, the attentional value of motion would be usefully capitalized. A moving ball is easier to find but no easier to hit.

8. *Novelty*. It is no news when the dog bites the man. When the man bites the dog, the incident has news value.

When introduced, a speaker before an Ohio high school assembly walked briskly to the front of the platform, removed his coat, then his tie and collar and even his shirt; but he did not stop then; he removed his trousers! For underwear he wore a gym suit; in the gym suit he gave a talk on the advantages of physical education in high school.¹

Kenneth Collins, former Director of Publicity for R. H. Macy and Company, created novel advertising of a very effective kind, as may be seen in the following sample.²



“--- and you call this a handkerchief?”

Little Timothy Threap on the front row writhing and scuffing his shoes, is paying the penalty of being impetuous. He's gummed up the magician's trick, all right—there'll be no bunnies pulled out of his shred of a hanky. Worse than that, he's made himself the object of everyone's mirth and scorn. Woe indeed is him.

The advantage of carrying a respectable handkerchief.

Novelty is dependent upon the setting in which the object is presented, for the new does not hold attention unless it is in part familiar. At home attention is attracted to a strange face; on the street, to a familiar face.

9. *Incongruity*. If a woman-hater of our acquaintance appears in public with a girl, he attracts notice, much to his own regret. The question immediately is provoked, “What's wrong with this picture?” If an item is so incongruous that we know it is out of order, we will note it readily.

It is said of a celebrated American preacher, who knows well how to arrest attention, and hold it, and generally does so by

¹Howard H. Higgins: *Influencing Behavior through Speech*, p. 44. 1930.

²Jerome Beatty: “How to Become a Millionaire,” *American Magazine*, July, 1931.

appropriate means, that on a very warm summer day, when he arose in his pulpit to preach, his first sentence was, "It's d—d hot this morning." That was a sudden surprise, which arrested and astonished every hearer. After a moment's pause, he proceeded, saying, "I heard that shocking expression fall from the lips of a man as I entered the church a minute ago." He then preached a withering sermon against the sin of profane swearing.¹



"May I see your ticket stub?"

Illustrating the factor of incongruity and, perhaps, size.

(Reproduced by permission of the *New Yorker*, and Richard Decker.)

C. Critical Comments. The important thing in attracting attention is to win notice for the particular item which it is desired to stress.² The pretty girl in the advertisement may be so attractive as to encourage the observer to ignore the product which is being advertised.

A church sometimes makes its appeal to young people

¹William Taylor: *The Model Preacher*, Chap. 4. 1859.

²See Higgins, *op. cit.*, pp. 44-45.

through the medium of bowling alleys, basketball, ping-pong, movies, dancing, and uproarious evenings in the church basement. The danger is that religion will be lost sight of in the glamour of social excitement.

Advertisers use clever slogans to attract attention to their products. Do you remember the slogan? Do you remember the slogan and forget the product it eulogizes? Test your own reactions.

1. Comfort through flexibility.
2. A skin you love to touch.
3. Not a cough in a carload.
4. His master's voice.
5. Time to retire.
6. 99 44/100 per cent pure.
7. The blade men swear by—not at.
8. Going, going, gone.
9. Good to the last drop.
10. The instrument of the immortals.
11. Make hard roads easy.
12. From contented cows.
13. A clean tooth never decays.
14. When it rains, it pours.
15. Rules the waves.
16. Pure as the pines.
17. A thousand things may happen in the dark.
18. Aged six months.
19. Ask the man who owns one.
20. It's fun to be fooled.

Turn to the end of the chapter for the correct answers.

III. MEANING

The central factor in the perceptual process is meaning. The mind does not soak up facts as a blotter absorbs ink. The mind is active, contributing meaning to the stimuli of which it has become aware. The act of interpretation not only adds meaning to what we seem to get through our senses, but even alters the character of the sense data

themselves. "Blindfolded, you know the difference" reads a cigarette advertisement. The truth is, most smokers, in spite of their insistence to the contrary, cannot tell one cigarette from another unless they see the label. A friend who did not like "Luckies" smoked them with unwitting pleasure when they were substituted for his Chesterfields in a Chesterfield package. An experiment conducted at Reed College by a graduate student in psychology demonstrated that blindfolded smokers could not identify popular brands of cigarettes. In fact, their identifications were correct more seldom than chance would allow, which means that the confidence on the part of the observers, plus a prejudgment leaning toward a certain brand, so confused their sensory experience as to produce results lower than those they would have obtained by wild guessing. The moral is: we live by labels—the knowledge that an article is of a certain brand goes a long way toward determining the nature of the sensations aroused by its consumption.¹

Perception is a complex affair. Take such a simple experience as seeing red. The naïve person thinks of red as being part of the object. But the red is really a mental affair. The experience of a certain wave length, as registered by the sense organs and conducted to the brain, means red. Now red may carry meanings on its own account: "Stop!" (traffic) or "Goal!" (hockey game), depending on the context in which the wave length appears. The sight of red stimulates the mind to supply the meaning, as in the case of the little girl who unintentionally operated a fire alarm box in trying to post a letter to Santa Claus. She explained to the firemen who rushed to the scene, "I thought that red box was for Santa Claus letters."²

¹Stuart Chase: "Blindfolded, You Know the Difference," *The New Republic*, August 8, 1928.

²See C. K. Ogden and I. A. Richards: *The Meaning of Meaning*. 1923.

Meaning, of course, depends upon a person's past experience. Suppose, for example, you hear a whistle. The sound, familiar to all motorists, means "cop" and, more important still, it means "slow down and pull over to the side of the road. What do you think this is, a race track?" Such a simple mental process as hearing a sound becomes very complex when past experience is brought to bear upon the present experience. The word "m-a-n" means one thing to a German and another thing to an American. When a person is reading a German passage, the word, of course, should be interpreted in its German context. A reader might be misled by the context in reading the following item on a sporting page:

George Duncan's numerous friends in the United States hope that he was misquoted the other night at a banquet in London when he charged Walter with putting a fast one over on the British professional golfers in the Ryder Cup matches at Worcester a year ago last summer.¹

The writer of this text was aware of the "golf context" as soon as he saw George Duncan's name, and so, when he came to the word "putting," he read it putting (as used in golf) instead of putting (as in "putting over a fast one"). The words are pronounced differently, and as soon as he reached the word "over," he realized it was *putting* and not *putting*.

Try this experiment. Study the picture on the next page until you grasp the situation. Then write your version of what is happening. Now analyze your story. Does your identification with the characters involved reveal anything concerning your own past experiences and the interests evolved from them? The meaning you give the situation sheds some light on your personality. This

¹From the Boston *Herald*, December 21, 1936.

technique for the study of phantasy is called Thematic Apperception.¹



(Camera Guild, Inc., New York City.)

Suppose you are presented with the following stimulus pattern:

5
2

What do you get? Perhaps you get 7. Why? You were not instructed to add the figures. Why, then, did you add, when there was no plus sign? You added because you were set by your past experience in arithmetical situations to do what you usually have done when a similar pattern was given. Perhaps, instead of adding, you subtracted to get 3, or multiplied to get 10. The character analyst might discover in your reaction a manifestation of

¹See H. A. Murray: "Techniques for a Systematic Investigation of Fantasy," *Journal of Psychology*, 1937, 3, 130-131.

See also H. A. Murray, et al: *Explorations in Personality: A Clinical and Experimental Study of Fifty Men of College Age*. 1938.

your character—if you obtained 7, you are generous; if 3 you are stingy; if 10, you are inclined to exaggeration or fertility.

Now, instead of leaving it to you to express your natural bent, suppose I determine your set for you by supplying the sign.

$$\begin{array}{r} 5 \\ -2 \\ \hline \end{array}$$

The only thing you can do in compliance with the instruction is to subtract. The Germans have a word for this kind of set—*Aufgabe*. *Aufgabe* is the problem or task which determines your set for you.

Münsterberg tried some class experiments to demonstrate the influence of attitude. He talked about university life and then exposed for an instant the word “courage”—a number of students read it as “college”; then he discussed the subject of colonial policy and suddenly flashed the word “Philistines”—the audience, as you would expect, saw “Philippines.”¹

A. Signs. In perception, we look for signs on the basis of which we give meaning to the stimuli. Victor Hugo once wanted to find out from his publishers whether a certain manuscript of his would be accepted, so he sent them a card which contained this: “?” His publishers replied: “!”

Through the process of interpreting signs, we come by experience to recognize that a wave length of 505 millimicrons means “green.”² Similarly the angles in the diagram of the table mean that it is to be projected in a certain spatial plane whereby the oblique and acute angles may

¹Hugo Münsterberg: *On the Witness Stand*, p. 34. 1908.

²A millimicron is the one thousandth part of a micron, or the millionth part of a millimeter; a micromillimeter. It is a unit of length used in measuring light waves. Symbol, μ .

be translated into right angles. Where is the animal in the picture on p. 370? How do you know? By what clue do you know that the cow is behind the tree? (The answer will be found under "d," on page 385.)



Certain wave lengths conveyed through the cochlea to the brain signify certain sounds which themselves are signs through which meaning may be comprehended.

"Feel thus Teins Ford ear roll Maine" means, visually, nothing in particular. Read it aloud rapidly, however, and the wave lengths through your ears will eventuate in sounds which, in their turn, will convey the meaning—the Stein Song: "Fill the steins for dear old Maine."

Gnomme attar; Anna lies align!
Nation mice lender verse says knot
Fork rip tick poet real Ike mine
How Aaron weal demeans allot.

Decipher the poem by auditory means and then refer to the footnote below.¹ Visually considered, these examples are nonsensical, but taken via hearing they become auditory sense data from which meaning is derived through the process of interpretation. Thus we see that meaning depends upon the recognition of signs.

The deciphering of signs by translating visual into auditory cues was the procedure followed by a proprietor of a bookstore who received, by mail, requests for the following books by persons who had obviously picked up the titles by hearsay:

1. Firework King, by Justin McCarthy.
2. The Old Pie Bus, by Warwick Deeping.

¹No matter, analyze a line.
Nay, shun my slender verses not,
For cryptic poetry like mine,
Howe'er unwieldy, means a lot.

3. Farmer's Suitable Pocket Book.
4. Jean's Universal Rounders.
5. Says a Man to Lily.
6. The Red Yacht.



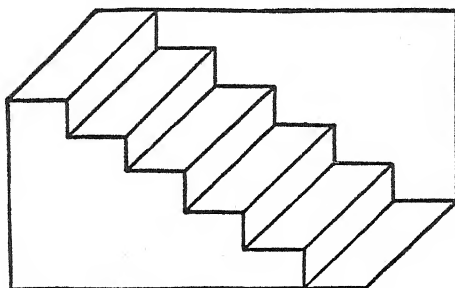
(Drawn by Warren Sillen.)

Would you know what to send? The books they really wanted were:

1. "If I Were King," by Justin H. McCarthy.
2. "Old Pybus," by Warwick Deeping.
3. "Pharmaceutical Pocket Book."
4. Sir J. H. Jeans's "The Universe Around Us."

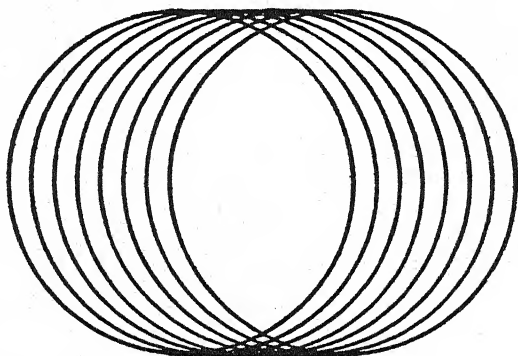
5. "Sesame and Lilies," by John Ruskin.
6. "The Rubáiyat."¹

B. Ambiguous Figures. A given stimulus may give rise to several interpretations. A stimulus which is likely to induce several meanings is called ambiguous. A classic illustration is the reversible staircase.



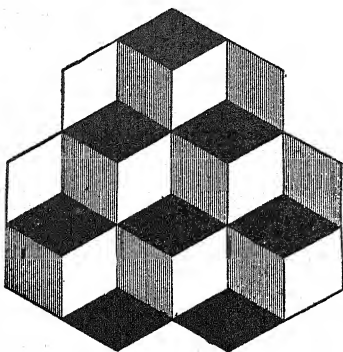
If you gaze at the figure, you will notice that at one moment you are underneath the stairs looking up at them and at another moment you are above the stairs looking down at them. The reversal may be facilitated by shifting the point of fixation. The figure will reverse in spite of all effort to keep it constant.

Another good reversible figure is a coil. First you are



¹*The Literary Digest*, May, 1930.

looking through one end and then, as it reverses, you are looking through the opposite end.



Find the wife and the mother-in-law in the puzzle at the bottom of this page. The wife's chin is the mother-in-law's nose.¹

Ambiguity resulted when a small boy saw a zebra for the first time. He asked whether it was a black animal with white stripes or a white animal with black stripes.

In the figure above, how many blocks are there, six or seven?

That the meaning of a stimulus may be misconstrued is sometimes capitalized.

Lazy Little Lulus

Acquitted of fraud in Budapest last week, Bookseller Bischl triumphantly regaled reporters with the story of how he had sold 2,000 copies of a cookbook to women through the mails by advertising: "This Book Is Guaranteed to Tell What a Girl Ought to Know before Marriage."

That a female was actually aroused to the point of pocketing her dignity and suing Bookseller Bischl for fraud



¹E. G. Boring: "A New Ambiguous Figure," *American Journal of Psychology*, 1930, 42, 444.

was due, he thought, to the real title (not advertised) of the book, "Lazy Little Lulu Learns to Cook."¹

Ambiguity was resorted to by Gladstone when he received a copy of a book from a proud author. He wrote in thanking him: "I shall lose no time in perusing your book."

The crucial thing for experience is not the stimulus, but how it is interpreted. Consider a few horrible puns:

Probably the most promising of all careers is that of a politician.

A sceptic declares that when he attended a seance all he heard was chuckles. He must have struck a very happy medium.

A Philadelphia woman who fired five times at her fleeing spouse now wants him to return home. She misses him so.

There is always a tie between father and son. Probably. And if there is, it's a safe bet that son's wearing it.

An Ohio butcher was recently held up and locked in his ice box by bandits. When released by the police, he was the coolest man in the room.

Mr. Hoover acted after getting a long letter from President Hindenburg. The Hindenburg line must be as good as ever.

That a given stimulus may mean all things to all people is illustrated by an amusing incident which took place in Minneapolis, where citizens listening to a Lenten program were astonished to hear the Courthouse chimes playing "How Dry I Am." Chime-Ringer Auld grew weary answering indignant telephone calls and explaining that he had been playing "O Happy Day," a good old hymn the tune of which had been appropriated for the barroom ballad.² A slap on the shoulder may mean "Hello, Buddy," "Good-bye, old pal," or "Tell it to the judge." The meaning, in each case, depends upon the context and the set of the mind.

¹*Time*, March 2, 1931. By permission of Time, Inc.

²*Time*, April 13, 1931.

C. Meaning and Set. Expectation determines ahead of the stimulus what the nature of an experience will be. A test tube in the vest pocket of a Lehigh University student exploded while he was eating in a crowded restaurant. Consternation reigned in the restaurant, and a woman became hysterical, insisting that she had been shot, but a physician's examination proved her uninjured.¹

Every hunting season there are many fatalities resulting from the fact that hunters are mistaken for deer or bears. In one case, a boy climbed a tree to investigate a gum seam. A hunter came along, heard a noise in the tree, looked up, saw a dark brown body there, supposed it to be a bear, and fired. The boy fell, badly wounded.

Four men called on a sick friend in Szegedin, Hungary. They were informed by the patient that his illness was due to the visits of a witch who cast a spell over him. While the sick man was speaking, an old woman entered his room, begging for alms. The four men hacked her to death. They were tried for murder and convicted. The judgment was appealed on the ground that their belief in witches prompted their sudden action and they were acquitted of murder.

In summing up, the judge of the superior court said: "The murderers acted under an irresistible impulse. Moreover, not only these statements, but all attendant circumstances, pointed to the presence of a witch."²

In early 1934, two taxi-drivers, Berrett and Molway, were indicted for a murder committed in a hold-up of the Lynn Paramount Theater. They were identified by a large number of witnesses. The trial was about to end in their conviction and probable electrocution when the real culprits confessed to the crime. In a situation calling for

¹The Boston *Herald*, March 25, 1931.

²*Ibid.*, January 20, 1928.

the recognition of a criminal, the positive identification of the suspect by one witness establishes a tendency in other witnesses to fall into line lest they appear stupid. Thus expectation facilitates identification.

A puzzle, once solved, becomes surprisingly simple, since you know exactly what to look for. The novice in the use of the microscope experiences difficulty in observing the appearance described by his instructor because his amateurish conception of the object to be seen is lacking in precision. He can become more adept in the use of the microscope by consulting the illustrations in the textbook, for they enable his mental eye to realize the pictures which it should entertain. He may be altogether too much influenced by the pictures thus suggested to his mental vision, however, and draw what is really not under the microscope at all. Training in correct and accurate vision involves the acquisition of an alert mental eye, which observes all that is objectively visible, but does not permit the subjective to add to or modify what is really present.

Reading is performed in snapshots and it is easy for the mind to fall into error through jumping to false conclusions. At times words may be read incorrectly when they are printed correctly. *Persona grata* may be seen as *persona non grata*, the *non* being inserted because it completes the phrase as the reader is more accustomed to seeing it. At other times words may be read correctly when they are misprinted, so that the radio program of "Big Bother" may quite possibly register upon the hasty reader as the program of "Big Brother," according to its usual form. The proofreader's illusion is another case in point. It is easy for an author to overlook errors in his manuscript because the very set which may have predisposed him to make an error may lead him to fail in its detection.

The strategy of football coaching illustrates how a team may build up expectation in its opponents, and then

thwart the established set by the sudden shift of tactics. Lou Little, the Columbia coach, prepared his team in such strategy for the Columbia-Stanford game of 1933. A series of plays was run off in which the quarterback faked passing the ball to Barabas, one of their star back-field players, and Barabas pretended to conceal the ball as he circled the opposing end. The Stanford tacklers on that side of the line chased him the first few times and then, as they decided to ignore him because they were led to expect the fake, Barabas was given the ball. He ran unmolested for the touchdown that won the game.

The naïve person thinks of perception as a passive process in which the environment impresses itself upon the mind, much as a signet ring leaves its impression upon sealing wax. To him the mind is a tablet upon which experience inscribes its record. Deeper analysis of perception, however, reveals the fact that the mind through its activity contributes an important part to the total awareness of the world in which we live. We create the world in which we live in accordance with our predispositions. In every perception two factors contribute to the result. The one is the nature of the object perceived, the other that of the percipient. The latter factor is the one that is apt to be overlooked and it is, therefore, the one upon which we are concentrating our interest at the moment. Literally, what you perceive depends upon your point of view. The mental set of the spectator is as important as the event which is witnessed. Both must be taken into account in an adequate description of any given situation.

It is proverbial that appearances are deceptive. Adjusted as we are to the most probable event, what seems to be is readily mistaken for what is. In our anticipatory attitude we unconsciously insert items to round out the picture we had expected to get, not realizing, in doing so,



IT DEPENDS ON YOUR POINT OF VIEW

—Doyle in the *Philadelphia Record*

our easy liability to error. The mind's eye perceives what it is prepared to experience.

Alexander Kerensky was slapped in the face by a young woman on the stage of the Century Theater in New York. The reporters present differed considerably in their descriptions of the manner in which the young woman struck the blow.

World: "Slashed him viciously across the cheek with her gloves."

News: "Struck him on the left cheek with the bouquet."

American: "Dropped her flowers and slapped him in the face with her gloves."

Times: "Slapped his face vigorously with her glove three times."

Herald Tribune: "Beat him on the face and head . . . a half-dozen blows."

Evening World: "Struck him across the face several times."

Mirror: "Struck him a single time."

Post: "Vigorously and accurately slapped him."

And this is what happened next:

American: "Kerensky reeled back."

Evening World: "He stood unmoved."

News: "He stepped back, maintaining a calm pose."

World: "He stood still, but used his arms to wave back his friends."

Herald Tribune: "He stood still, with his arms thrown back."

Journal: "He reeled."

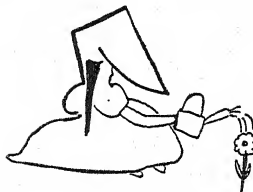
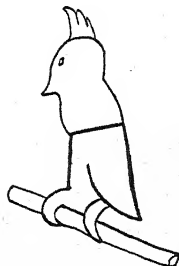
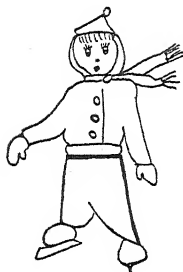
Post: "He remained unmoved."

Mirror: "He reeled from the blow. His supporters were stemmed by a handful of royalists. Fists flew; noses ran red; shirts and collars were torn."

These accounts come from trained reporters who were set to witness what transpired. Casual witnesses would be even more inaccurate in their descriptions of the scene.

History is supposed by the naïve person to be a record of events as they actually occurred. It often turns out, however, to be a description of the impressions obtained by certain observers whose predispositions entered into their reports of the scenes. Thus it is difficult to determine exactly, either what Lincoln said at Gettysburg, or what was the manner of his delivery. Some say he used no notes, some that he held his manuscript in his left hand but did not read from it, some that he read every word, and some that he held his manuscript in both hands and read it in part. Morse in his *Life of Lincoln* states that when Lincoln finished the manuscript, he added a quotation from "Webster's Reply to Hayne." Barton says that he did nothing of the kind.¹ If such a variety of opinions regarding a comparatively recent occurrence is a sample of what history may be on a larger scale, especially where ancient times were concerned, we begin to appreciate that the historian is constantly faced with the problem of sifting the evidence to distinguish fact from fancy.

* ¹W. E. Barton: *The Life of Abraham Lincoln*, Vol. II, pp. 202-207. 1925.



CURLY-CUES

Showing how a sign or cue conveys different meanings to different people. The figure in the center is the cue which was used by the students as the basis for their drawings.

Each of us has the windows of his house built for him by experience, and we can look at life through no other case-ments. Looking at a bit of landscape, one man sees it as a prospect for a farm, another for a summer home, another as a site for a hotel, another as a subject for painting. "Yet they are all looking at the same scene, each with the same kind of bodily eyes, but very different mental ones. They bring to the scene their dominant interests; and that is what they really see. What you get out of an experience, depends upon what you put in, and you could not change these men's outlooks without first changing their insights."¹

The set of the individual determines not only what he observes but also the meaning he gives to a particular situation when he interprets the signs involved. Any given stimulus, therefore, may convey very different meanings to different people, varying in accordance with the diversity of their sets.

IV. PERCEIVING SPACE

We tend to think of the perception of space as a passive registration, whereas the truth of it is that the mind makes its judgments of location and distance by means of certain signs which, by virtue of experience, come to convey definite spatial meanings.

A. Tactual Space. Have a trustworthy friend stick a pin in you. Where did he prick you? If your eyes are open, of course, you have visual cues to aid you. But in addition to such cues, you are able merely on the basis of tactual cues to locate the spot with some degree of accuracy. A prick on the arm feels different from one on the foot. That qualitative difference has been called the "local sign." The distinctiveness of the local sign may

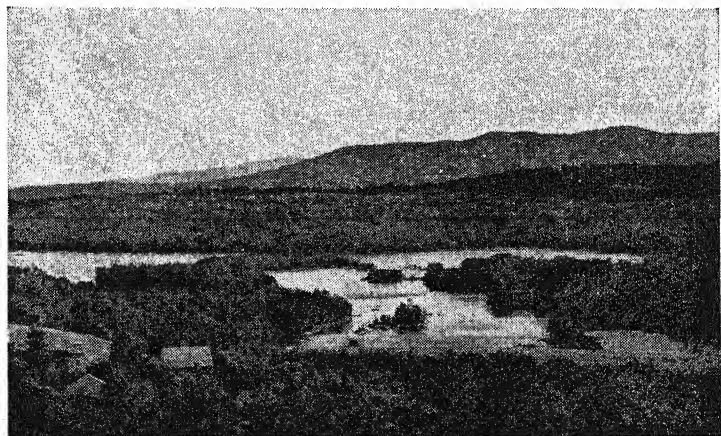
¹Joseph Jastrow: *Keeping Mentally Fit*, pp. 20-21. 1928. By permission of Greenberg, publishers.

be due in part to the particular nerve conducting the impulse from the skin. Localization is most accurate where the nerve endings are the most numerous. If a member is amputated, sensations from the stump are still referred to the missing part.

In other situations, reflex movements, executed to protect the threatened spot, aid in the localization.

B. Visual Space. Far more is known about the perception of visual space. It will be sufficient to illustrate the principles of spatial perception if we limit our discussion to judgments of distance.¹

The naïve person does not pause to realize that the visual field is flat, a single plane of two dimensions. How do we get the experience of the third dimension, giving us spatial depth in the plane extending away from the observer? The most effective way of comprehending the nature of the problem is to consider a picture which is printed on a card of two dimensions, occupying one plane. In spite of the restriction of the view to one plane, we can tell that objects are near or far. Analyze this lake scene



¹M. D. Vernon: *Visual Perception*. 1937.

and write down the signs you avail yourself of in determining the relative positions of trees, lake, and mountains. Then check your list with the following discussion.

One of the striking aspects of spatial judgments is the fact that the individual successfully estimates spatial relations without explicit knowledge of how he does it. The individual is unconscious of the factors underlying his judgments. This point will become more apparent as we proceed.

The criteria of visual distance are classified into primary and secondary cues.

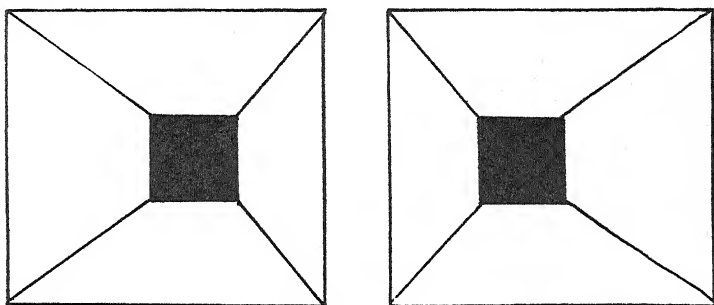
1. Primary Criteria. The primary criteria depend directly upon the structure of the eyes.

a. Binocular Parallax. The first of these is binocular parallax.¹ This refers, essentially, to the fact that a slightly different view is presented to the two eyes as a result of the slightly different angle from which an object is viewed by each eye. The fact that the images of an object on the two retinas are different may be demonstrated by holding the forefinger of your right hand a foot from your face. Look at it with your right eye, keeping your left eye closed; then look at it with your left eye, keeping your right eye closed. Note the distinction between the two views. Now hold your finger at arm's length and perform the same operations. Note that the two views do not differ so much. The degree of doubleness, the amount of difference between the two views, is a cue to the distance; the less doubleness, the greater the distance away. It is important to note again that this whole process may be completed unconsciously.

The stereoscope applies this principle. An object is photographed from two appropriate angles, giving two distinct views. When the two views are fused, they give an impression of solidity (distance).

¹This phenomenon is also known as retinal disparity.

Hold a piece of paper between the two figures in a plane to the nose so that the left-hand figure is seen with the left eye and the right-hand figure with the right. The figures will fuse, producing an impression of solidity. The same experience may be produced by looking way beyond the figures so that they just come into the view.



Take the top off your fountain pen and give your fountain pen to a friend to hold in a horizontal position a yard in front of you, in the right to left plane. Then with one eye closed try to put the top on the pen. Lacking the cue of binocular parallax, you will probably experience some difficulty.

One-eyed persons, though handicapped by the lack of binocular parallax, learn to judge distances on the basis of other cues.

We are all one-eyed, to a certain degree, since the two eyes do not contribute equally to the formation of the single stereoscopic picture. In a right-eyed person the right eye contributes practically all of the picture, in a left-eyed person the left eye. In the former, the left eye merely functions in a subservient fashion to add accessory information to the view afforded by the dominant right eye. Look at a tiny spot in the wall at a distance of a few feet. While still looking at the spot, take a finger-ring and hold it where you will be looking through it. Then

close your left eye, and determine whether you still see the spot through the ring. If you are right-eyed, you will. Next close your right eye and look at the spot with your left and you will see it outside the ring. If you are left-eyed, the result will be reversed. Dominancy and sub-serviency in eyes are peculiar to the human being.¹

Tests are being developed by Alvah R. Lauer of Iowa State College to examine the fitness of applicants for licenses to drive automobiles. One aim of the tests is to determine the efficiency of depth perception, since those persons who are defective in this particular may fail to gauge the distance or speed of an approaching car and may, therefore, be a menace on the public highway.²

b. Accommodation. The second primary criterion is derived from the muscular strains involved in accommodating the lens of the eye so that the image will be focused exactly on the retina. This cue is useful only for distances within a few feet of the eye where the kinesthetic sensations from the muscular contractions are clearly noticeable. There is more strain when objects are near since the divergent rays from a near object are not as easily focused as the more parallel rays from a distant object.

c. Convergence. The third primary criterion is convergence. When an object is near, muscular strain is experienced as the eyes are turned in (converged) upon the object. For a distant object there is less convergence and therefore less muscular strain.

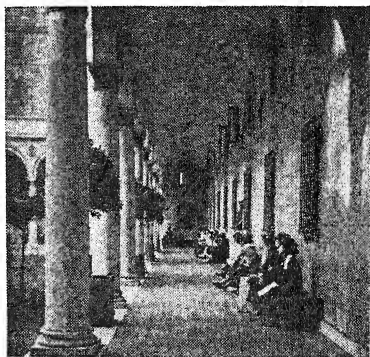
2. Secondary Criteria. The secondary criteria are more distinctly psychological.

a. Linear Perspective. First we have linear perspective as a basis for the experience of depth. The course of contour lines in the field of vision, like the apparent con-

¹For a similar technique, see N. V. Scheidemann: "A Simple Test for Ocular Dominance," *American Journal of Psychology*, 1931, 43, 126.

²A. R. Lauer: *Manual of Tests for Automotive Operators*. Iowa State College, Ames, Iowa. 1934.


vergence of railroad tracks in the distance, is an important cue. Everyone knows the tracks do not actually converge. Their apparent convergence is interpreted in terms of distance, the more converging, the farther away the contours. Note lines in the adjacent picture.



b. Aërial Perspective.

In the photograph on page 381 you will notice that you can recognize the distant hills by the indistinctness of their outlines. On a clear day, distant objects look near; in a fog, a ship may be nearer than it appears to be.¹ Distant mountains may be distinguished by a hazy blueness.


c. Light and Shade. Light is interpreted as nearer the observer and shade as farther away if the source of illumination is from the direction of the observer. The effects

 Sun



Tree

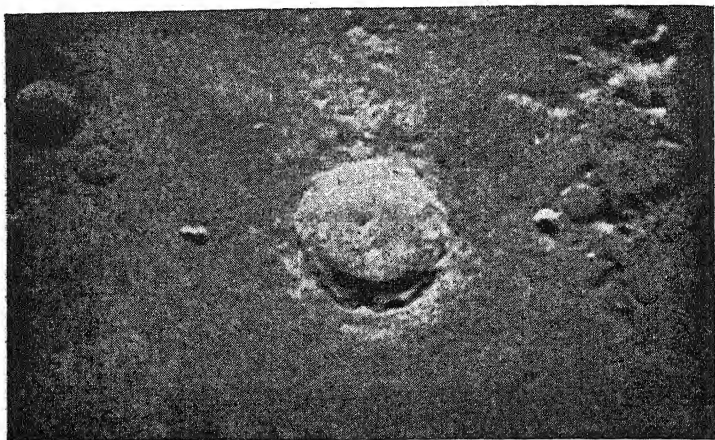
Shade

 Observer

of light and shade are strikingly brought out in the illustrations on the following page.

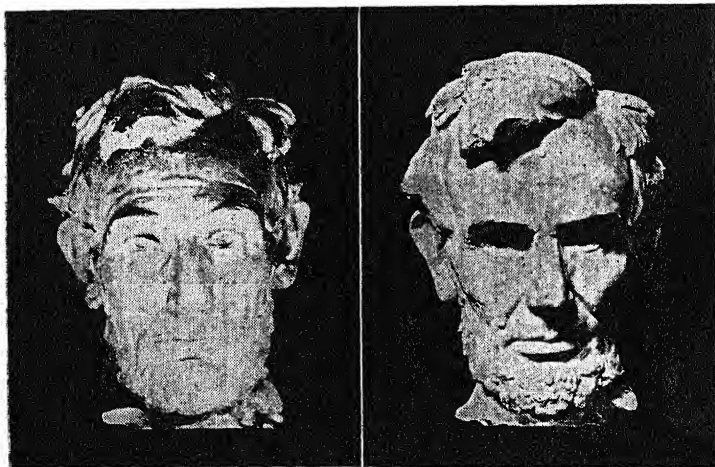
d. Interposition. Near objects often conceal parts of objects farther away. Turn back, for a further illustration, to the animal parking behind a tree on page 370.

¹For some excellent illustrations of aërial perspective, see Knight Dunlap: *Elements of Scientific Psychology*, pp. 274-275. 1927.



Observe the figure in the center. Is it a mound or a depression? Turn the picture gradually around to the upside-down position and watch what happens to the figure as you do so.

(The photograph is of a lunar crater and is reproduced by courtesy of L. A. Brigham and the Harvard College Observatory.)



WRONG AND RIGHT WAYS TO LIGHT LINCOLN

Differences in light and shade so alter the distinctions in depth as to give the features a radically different expression.

(Courtesy of Mr. J. W. Milford and the General Electric Company.)

It is very difficult to estimate distance on open water because there is no cue from the relative locations of objects.

Objects in the upper section of the visual plane are likely to be farther away.

e. Apparent Magnitude. Through experience we become familiar with the size of an object. If the apparent magnitude diminishes, we infer that the object is farther and farther away. One does not think that a person in the background of the photograph is actually smaller than the person in the foreground but rather that he is more distant.

3. Further Cues. In concluding the discussion of visual distance, it should be stated that the visual cues are supplemented by other cues, notably tactual and kinesthetic, which increase the accuracy of judgment. The child sees something; he reaches for it; he learns how much muscular work must be performed to attain an object which looks to be a certain distance away. He sees in one plane; he can reach (kinesthetic) and touch (tactual) in three dimensions.

If you care to determine how much we depend upon a combination of cues, lay out a line on the floor and walk on it, one foot over the other, while looking at the line through the wrong end of a pair of opera glasses. The glasses distort the visual cues enough to disturb the kinesthetic adjustment.

C. Auditory Space. In these days of the automobile, it is quite important that we localize sounds accurately. It is a surprising fact that we cannot tell by our ears whether a sound comes from the front or from the rear. Fortunately we have eyes to help us in front; in the rear we can only trust to luck. If a witness in court states that the pistol was fired on the road behind him on the dark night of the crime, his testimony is worth nothing.

Test yourself. Station one person directly behind you and another directly in front of you, both to take turns in varying sequence in making identical sounds. Localize them. Your judgments will be subject to grave error.

It is well for us that we have two eyes. It is also an advantage that we have two ears, for it permits us to localize with a fair amount of precision because of the difference in phase.

One indication by which a sound is localized is the relative intensity in the two ears. The hearer localizes toward the more intense sound, the ear farther from the stimulus falling in a shadow. By means of the binaural ratio¹ in intensity, localization can be accurate. When a sound comes from directly in front or behind, the intensity is the same in both ears, thus baffling the judgment.

Another cue for locating a sound is the factor of time. The hearer localizes toward the ear which is prior in picking up the wave. The phase of the wave differs in the two ears, affording a further basis for judgment. The presence of timbre facilitates accurate localization.

V. PERCEIVING TIME

Aside from the aid of watch or clock, duration may be determined by reference to the experiences occurring during a given interval. When a person is busy, time flies; holidays pass rapidly. Days of illness drag on forever. Filled time is likely to be short while it is passing, and long in retrospect; empty time, long in passing and short in retrospect.

Have you ever dozed off after your alarm had run itself down, only to awake with consternation as you fear you have overslept your train to school or office? It seems as if an hour must have been given over to slumber, and then you look at the clock to see that only five minutes have

¹Binaural ratio means the relation of the two ears.

gone by. The illusion is due to your dreaming, in the course of which events may occur in a brief period which would consume a much more protracted interval in your waking life.

Various sensations, such as hunger or a full bladder, supply cues for the judgment of time. Stomach contractions serve warning that the meal hour approaches.

It is possible, by practice, to determine in advance the hour you wish to awake, and then to do so at the time you have set for yourself. The estimation is made in terms of habit rather than by means of any occult power. A man whose business it is to set all the clocks in a large office building carries out his work without reference to a watch. He has trained his judgment till he can rely on it perfectly. He is known as "the human alarm clock." When some persons want to arise early without resorting to a Big Ben, they lie awake all night wondering whether the time has arrived to rise, and then doze off in the early hours of the morning into a sleep that continues indefinitely.

VI. THE RELIABILITY OF OBSERVATION

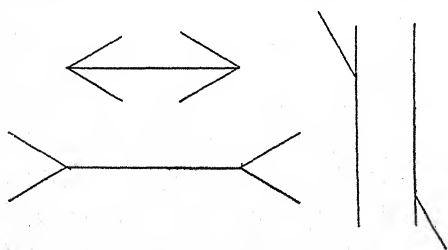
A. Testimony. A witness mounts the stand and swears before the court to tell "the whole truth and nothing but the truth, so help me God!" With this weighty oath sworn with a hand on the Bible, can the court be justified in relying upon the testimony? Only with many reservations. Assuming the witness is honest and disinterested, he may be describing not facts but illusions. The most obvious course is to lay the blame for misstatements on a faulty memory. The real source of error, however, is usually inaccurate observation.

A robbery took place in a railway train. Three diamond merchants were found, gagged and bound, in their drawing room. Five passengers, all of them sitting within a few yards of the door to the drawing room and facing it,

asserted that they had seen nobody enter the room since the three merchants had returned, following dinner, and closed the door from the inside. The porter, who had been standing near the door for an hour, stated that he had likewise seen nobody, besides the merchants, enter the room. The detective discounted the testimony of the passengers and the porter, because the evidence of a robbery was too convincing, and because he knew from experience that people do not see what is happening around them. The bandits were captured the next day.¹

Testimony is unreliable because our sense organs, our sets, and our memories deceive us. Leading questions may mislead. Fictitious facts, it may be said, are usually consistent with facts actually noted. The technique of selecting the facts determines their very nature. That rules of evidence are required in law indicates how problematic "factuality" is.

Upon whose testimony can we rely? Can we ever determine the facts? If our senses fool us, if our predispositions trick us, if our recall is subject to subtle perversions, how can we know that we know anything? Philosophers have puzzled over this problem for ages.



MÜLLER-LYER ILLUSION

To give you more material for cogitation on this matter, let us study a few visual illusions, though it should be stated that there are illusions in other sensory fields.

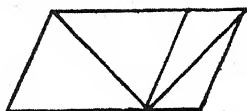
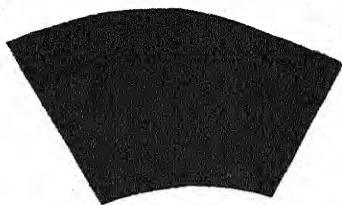
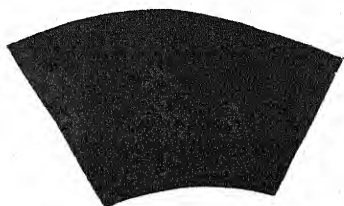
B. Visual Illusions. An illusion is an erroneous perception. A familiar example is the Müller-Lyer illusion.

¹Sherman Gwinn: "Unseen Eyes Protect You When You Travel," *American Magazine*, January, 1929.

Which is the longer of the two horizontal lines? They are actually equal in length. The observer is fooled, partly because he does not restrict his attention to the specific parts to be compared.

Try this one. Which figure is larger in area?

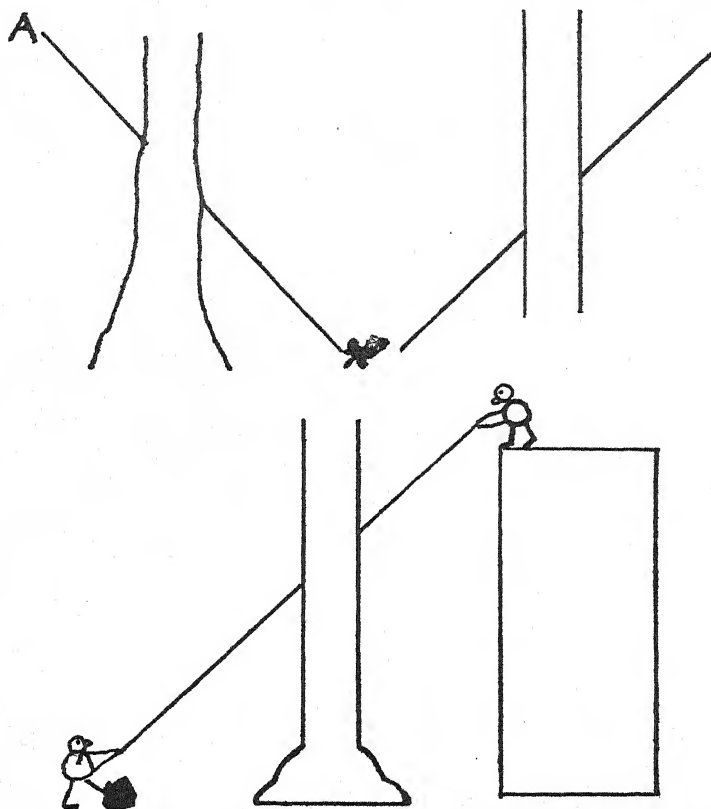
Then go on to the figure below at the left. Draw the two lines equal in length. Now add the lines necessary to complete the figure on the right. Which diagonal now appears the longer?



In all of these cases the items to be compared have been confused with near-by stimuli.

Suppose you were out hunting and a bird flew in the line indicated in the illustration at the left at the top of the next page, where would you aim? If you aimed at A, you would be shooting accurately, but you probably would not aim at A, since, as you will notice, the line of flight, though straight, does not appear to be straight. To hit the bird you would have to discount the illusion to an exact degree. This illusion is known as the Poggendorf illusion.

Draw the Poggendorf figure as it appears on the right at the top of the next page. Then complete the figure with a man on each end. Imagine the line is a rope and tell the men to pull it taut. Watch the line straighten out.



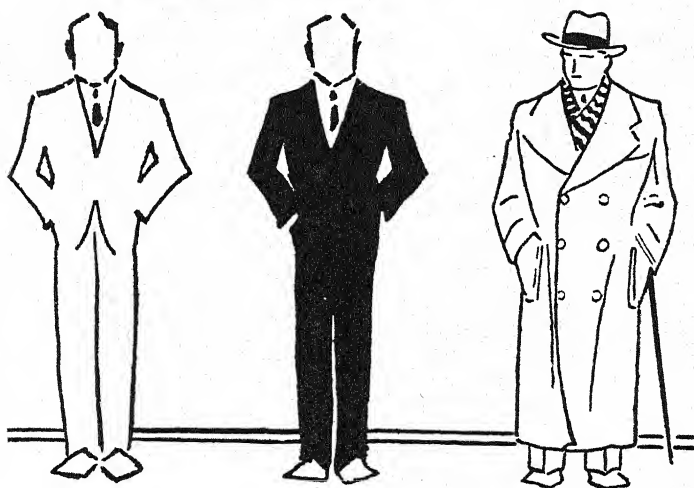
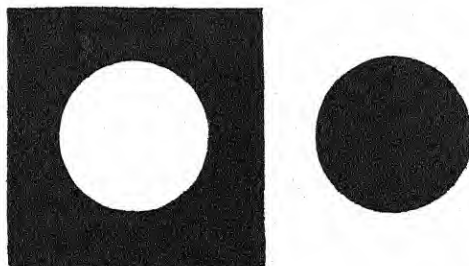
One explanation for the Poggendorf illusion is in terms of angles. Angles made by straight lines, through experience, are translated into right angles seen in perspective. Imagine that these lines represent two roads crossing at right angles. Merely transfer them to a different plane (perspective) to gain this impression. The translation of angles in experience leads us to overestimate acute angles and to underestimate obtuse angles. Apply this fact to the explanation of the Poggendorf illusion.

Habit derived from the repeated use of perspective leads the observer to overestimate the vertical, since the



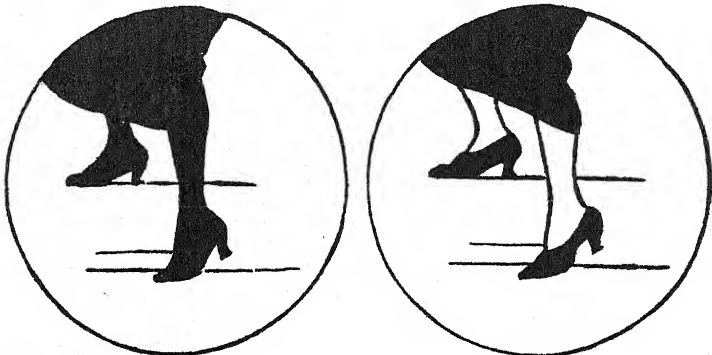
vertical line, in perspective, represents a line continuing into the distant background.

C. Applications of Illusions. Light colors exaggerate the apparent size. Small men, therefore, look sturdier in

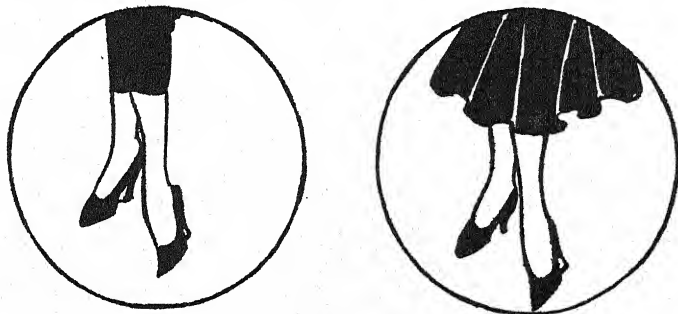


light-colored clothes. Light-colored jerseys are worn by football players to exaggerate their bulk. Short men should not wear long overcoats.¹ (See page 393.)

Shoes which contrast in color with the stockings accentuate big feet.



A plain straight skirt makes large ankles look larger; a full and rippling skirt gives the ankles a slim appearance.

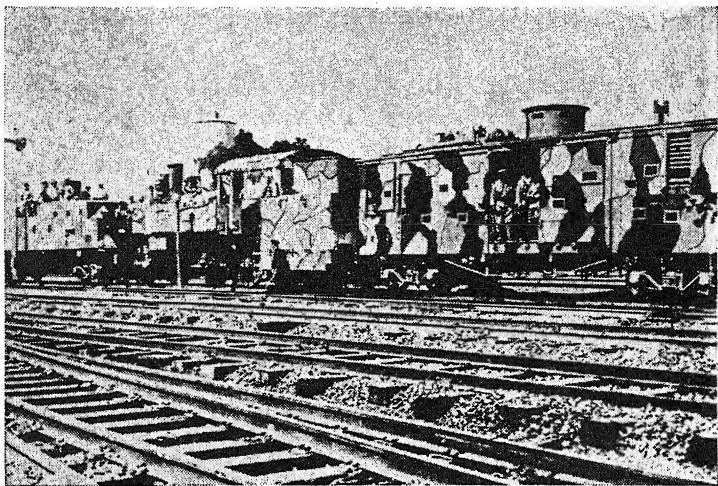


(Drawings by R. Wilson Hammell.)

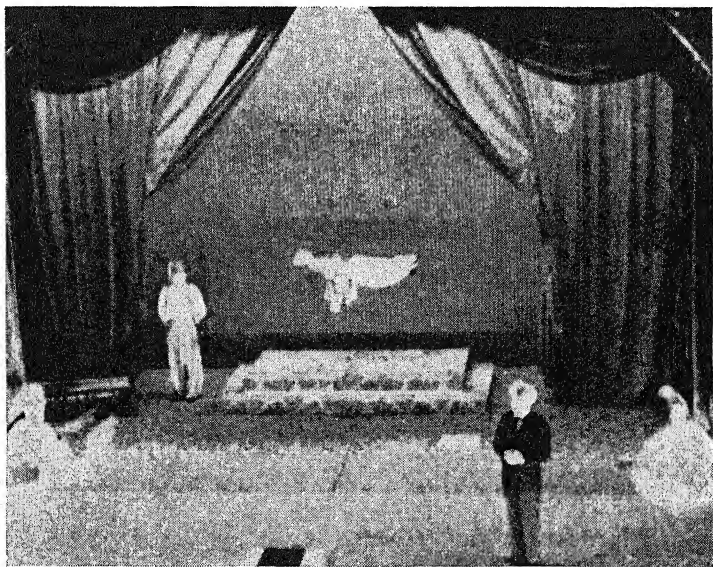
Camouflage has become a valuable phase of modern warfare.² Objects are painted in such a way as to fit into the background when seen from the distance.

¹"How Your Eyes Deceive You," *Popular Mechanics*, September, 1926. By permission of *Popular Mechanics*.

²See *Fortification: Camouflage for All Arms*. War Department, Washington, June 15, 1926. Photograph reproduced by permission of Acme Newspictures, Inc.



A CAMOUFLAGED TRAIN



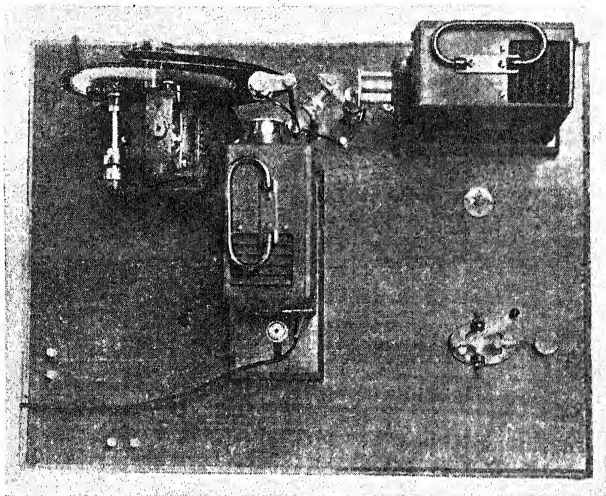
Showing how magicians cause "a body to float in mid-air without any support." Look carefully and you will notice the wires holding up the body. They are well disguised by the vertical grooves in the design of the background.

(Reproduced by courtesy of Francis E. Winter.)

VII. PROBLEMS OF ATTENTION

A. Range. There are four major problems of attention: range, duration, division, and degree.

Only a certain amount of the objective world can be taken in through one momentary perception. The amount which can be absorbed through a passing notice



PROJECTION TACHISTOSCOPE

This instrument consists essentially of a pair of simple projectors using standard width movie film but arranged for "stills" instead of motion pictures. One of these projects the pre-exposure field, with fixation point; the other projects the exposure material. The two fields are thrown on the same screen area, and are alternated by a magnetically controlled reciprocating shutter. The timing of the exposure period is accomplished by means of a small motor-driven timing disk.

(Reproduced by courtesy of the Marietta Apparatus Company.)

is known as the span of attention. Under experimental conditions the stimulus is exposed by a tachistoscope, an instrument which makes it possible to control the interval during which the stimulus appears at a slot in a screen and to regulate the intervals between successive exposures.

The span to be discussed here is sometimes described as the simultaneous span as contrasted with the successive span involved in the experience of recognizing how many times the clock has struck, without actually counting the bells.

Turn the page upside down, take one glance at the printed letters, and turn the book right side up again.

H T I V I P T D E V H

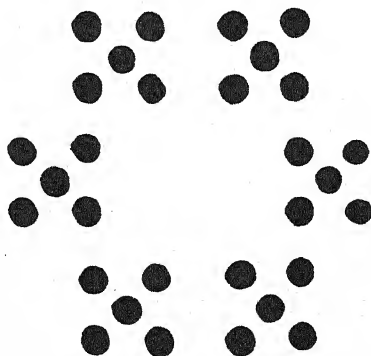
Write on a piece of paper what you saw.

Repeat the operation with the letters printed below.

V I H P T E D V T I H P

We learn by experience to group stimuli, thus extending considerably the span of attention.

How many dots do you see in one glance?



A bridge player may be able to tell without counting his cards that he has been dealt fourteen cards instead of the regulation thirteen.

A person may become so completely absorbed in one activity as to be absentminded so far as any other interest is concerned. Absentmindedness is really narrow present-mindedness. Attention may be compared to a lamp—the

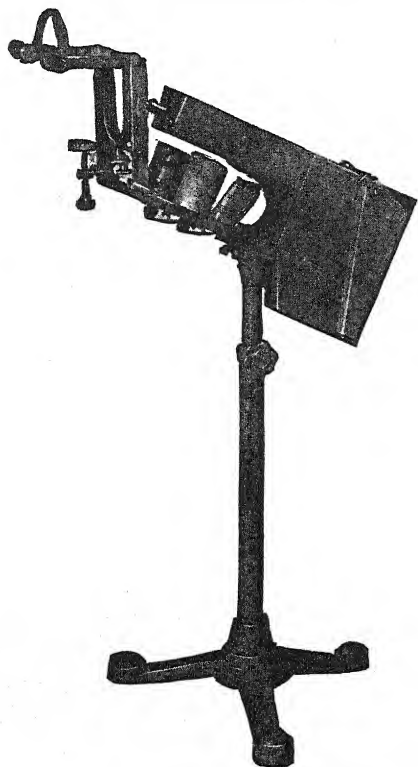
lamp with a wide illumination will throw its rays over a wide area, or a bull's-eye lantern will narrow its light to a small field. The secret-service man and the hostess must cultivate a wide span—they must see and hear all. The surgeon, on the other hand, trains himself to concentrate on a narrow field.

Speed in reading depends upon the attainment of a wide span, though a wide visual span does not guarantee efficient reading. Some people read by words, others by phrases, others by clauses, others by sentences, and others by paragraphs. Inefficient reading of foreign languages is encouraged by the "word" method when the "meaning" method is so much more advantageous. Speed in any kind of reading depends upon the quick apprehension of meanings. Six words per second, or about four and one-half hours for a standard-size book, is good average reading speed. Interest increases speed in reading, as we notice when we turn from a serious book to an exciting novel. The fast reader eagerly presses forward to get the answers to questions which have occurred to him. The brain, not the eyes, determines the speed of reading. The eye moves in a series of snapshots with pauses between. These pauses are needed to see the material clearly, but still more to give time for the meaning to be grasped. They take up about 95 per cent of the reader's time, the small remainder being all that the eye requires for its actual motion across the page, once the eye mechanics of reading are mastered. The eye as a machine is able to operate faster than the mind can grasp the sense. Interest, by hastening the grasping process, increases the speed of reading.

Gray reports that many college students are handicapped by immature and deficient reading habits which impede their academic progress to a serious extent.¹

¹W. S. Gray: "Reading Difficulties in College," *Journal of Higher Education*, 1936, 7, 356-362.

Rapid readers, research has shown, read approximately 25,000 words, or 63 pages, per hour, while slow readers read approximately 7,000 words, or 18 pages, per hour. Allowing 400 words per page, the rapid readers can read



OPHTHALM-O-GRAPH

This instrument is devised for photographically recording eye movements while reading. While the subject is seated at the instrument, tiny light reflections from his eyes are focussed on the view finder. A turn of the switch starts the film, and as the subject reads a short printed selection, the pencils of light reflected from his eyes accurately trace every ocular movement. Any lack of coördination, any evidence of slow response, and any difficulty in securing the rapid consecutive fusion required in reading, are all revealed in the photographic record. Thus visual efficiency can be objectively demonstrated.

(Reproduced by permission of C. H. Stoelting Company.)

43 to 45 pages more per hour than the slow. The rapid readers also gain a better comprehension of the material.

Reading speed can be improved by practice. Stone reports, on the basis of results secured in experiments, that the typical college student may readily increase his silent reading ability 50 per cent.¹ Moore analyzed reading

¹C. W. Stone: "Improving the Reading Ability of College Students," *Journal of Educational Method*, 1922, 2, 8-23.

difficulties of college freshmen to serve as a guide for remedial procedures. He found four main factors responsible for verbal inadequacy, viz., poor vocabulary, the memorizing instead of the analyzing attitude, inability to get the central thoughts of paragraphs, and slow, short, and regressive eye movements.¹ Exercises were planned to provide practice in speeding up reading. For example, lines are arranged with dots located at certain distances and the subject trains himself to read each line by fixating on the dots, so that he covers a line in three fixations in case that is the number of dots provided.²

At the Harvard psychoeducational clinic they show the slow reader movies of lines of type that force him to follow the movements a skillful reader's eyes would make under the same circumstances. Actually, the subject is shown a page of white words on a black screen. As the movie begins, the words are all just dimly readable, but as the eye starts to read along the top line, successive significant groupings of words in the line flash out brightly, phrase by phrase, as they would be scanned by the skillful reader. Each phrase appears bright for an instant then dims and the next one flashes on. Readers generally make a slightly longer pause at the start of a line and after punctuation, causing fluctuations that the pictures can reproduce. They can also delay momentarily over difficult words or phrases, as the normal eye does. The pictures also may be graded in speed and difficulty to the abilities and needs of students at all levels, from the grade schools, through college and beyond.³ The method has great possibilities

¹H. Moore: "Diagnosing and Caring for the Reading Difficulties of College Freshmen," *Journal of Psychology*, 1935, 1, 139-143.

See also W. L. Valentine, M. E. Troyer, and M. A. Brown: *Eye Movements in Reading* (film). Columbus: Ohio State University. 1936.

²See H. Moore: *Reading and Study Aids*. 1935.

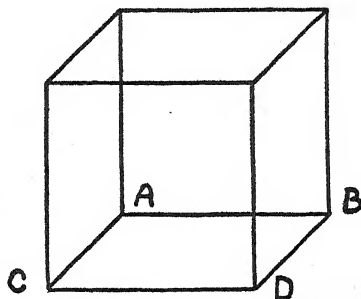
³See W. F. Dearborn, I. H. Anderson, and J. R. Brewster: "A New Method for Teaching Phrasing and for Increasing the Size of Reading Fixations," *Psychological Record*, 1937, 1, 459-475.

because good reading habits can be duplicated so accurately by the movies.

B. Duration. Attention can be directed toward a single stimulus for only a brief duration. Attention fluctuates, probably because the threshold for the stimulus varies with changes in blood pressure, respiration, and other physical conditions. There are a multitude of objects to be noticed and adjusted to. A shifting attention, therefore, has some adjustmental value. When the sense organs become adapted to a stimulus, fluctuation is facilitated.

Fluctuation may be studied by the observation of a minimal stimulus, that is, a stimulus so faint as to be barely above the threshold.¹

A physician named Urbantschitsch was the first to discover that a faint stimulus like a watch tick gives rise to fluctuating sensations—the ticks are heard for a few moments, then they are not heard, and then they are heard again. The ticks come and go at intervals.



AN AMBIGUOUS FIGURE

Reversible perspective is likewise good material for studying fluctuation. Look at the cube with the line AB in the foreground and then in the background. Practise on the fluctuation by shifting the fixation of the eyes from AB to CD and back again. Then stare at AB and try to keep the figure steady. Soon it will shift in spite of your efforts to prevent the fluctuation.

Experiments conducted by Bills show that gaps occur regularly in attention, especially under the influence of fatigue.

¹J. P. Guilford: "'Fluctuations of Attention' with Weak Visual Stimuli," *American Journal of Psychology*, 1927, 38, 534-583.

The mind of a person not physically fatigued apparently takes a rest of a second or less about three to five times a minute. A tired person, however, may "block" as often as eight or ten times a minute, the block covering a space of two or three seconds.

Subjects sit before an illuminated slit, their fingers on a machine that looks like a five-keyed typewriter.¹ The keys represent red, green, blue, yellow, and white. The subject punches the keys as he watches a tape moving through the slit and exposing the same colors. The colors on the tape are presented in haphazard order. As soon as the subject sees a color, he depresses the proper key. His reaction is recorded, together with the reaction time. Simultaneously the tape moves, exposing another color. When the subject's mind goes "blank," he cannot recognize the color. The hesitation shows on the chart where the number and duration of blockings are recorded.²

These mental gaps are sometimes disguised by speakers who resort to certain word-habits like "Ah-ah," and "Yes-yes," and "but-a, but-a, ah-and-a."

C. Division. The term *division* implies that there can be more than one attention at the same moment. Caesar is supposed to have dictated different material to several different stenographers at once. Such a performance is literally impossible because Caesar only had one tongue to wag.

Attention may be rapidly shifted from one object to another in successive moments. A person who listens to the radio while he attempts to read will find that each stimulus helps him to take his mind off the other.

The problem of division is really one of organization. Just as the span of attention is extended by grouping, so

¹See A. G. Bills: "A New Psychergometer," *Journal of General Psychology*, 1936, 14, 487-489.

²A. G. Bills: "Blocking in Mental Fatigue," *Journal of Experimental Psychology*, 1937, 20, 437-452.

separate acts can be performed at once when they have been integrated into a single pattern of behavior. Playing the piano with both hands is not a task in division but one in coördination. Similarly, two activities may be carried on simultaneously where one of them has become automatic. A woman may knit and talk at the same time, inasmuch as talking, for her, has become automatic.

Increasing the span of attention through skillful organization of activity makes it possible to attend to various objectives simultaneously. It is not a question of division but of integration.

D. Degree. Attention was compared to a lamp. Attention may be of a high degree (consciousness very clear), comparable to the illumination of a hundred candlepower lamp; or of a low degree (consciousness very dim), comparable to the illumination from a three candlepower flashlight. How much attention is a person giving to an object?

One way to ascertain the degree of attention is to measure the reaction time—the more attentive, the quicker the response.

Another method of measuring the degree of attention is in terms of accuracy—the more attentive, the more accurate the response.

Still another mode of determining the degree of attention is to submit the individual to measurable distractions—the more attentive, the less will distraction interfere with performance.

On the face of it, it would seem that distracting stimuli would diminish the speed and accuracy with which a given task were performed. Yet distraction often goads the individual to higher efficiency. He makes such an effort to resist the distraction that he overshoots the mark, and does better than he would have done under circumstances apparently more favorable.

Dr. Geoffrey A. Haylock of London discovered in the course of studies of the amounts of work done by women factory employees that many of the girls actually did more work on days when they had reported headaches than on days when they felt entirely well. Two reasons may account for this paradoxical fact. One is that girls with headaches are less interested than usual in their surroundings and their companions. Accordingly, they do less talking and their attention is less distracted. They are likely to do more work, especially if the work is on a piece-work basis, where each worker can speed up or let down individually without being affected by the others. The second is that mild pain often can be relieved by concentrating the attention on some task. Some of the girl workers apparently concentrate on their work in order to forget their headaches, which results in more work accomplished at the end of the day. Since distraction sometimes facilitates performance, it might be concluded that radio programs should be supplied in the reading room of the public library. The difficulty is that the effort necessary to resist distraction is so fatiguing that it more than counterbalances any advantages to be derived from the superior performance of the task in hand.¹

The most persistently distracting noises are those carrying meaning. It is harder to work with others talking in the room than with the hum of a machine. It is harder not to try to listen. If persons near by are whispering, it is impossible to resist the impulse to listen—for if they are talking in undertones, they are probably saying something worth hearing. A woman sitting in a theater remarked to her companion, "I wish those pests behind us would talk more distinctly."

¹See H. B. Hovey: "Effects of General Distraction on the Higher Thought Processes," *American Journal of Psychology*, 1928, 40, 585-591.

See also F. C. Dockeray: "Attention, Distraction, and Fatigue," *Journal of Comparative Psychology*, 1922, 2, 331-370.

An advertisement for a silenced typewriter depicts a man cursing a fellow golf player who has ruined a putt by making a distracting noise at the wrong moment. The next picture shows the same man in his office in conference, trying to put through a big deal. The noise of the typewriters is interfering with his thinking, but he does not seem to care enough to do anything about it.

Most of us have become so adapted to noise that we have attained a state of complete indifference. Little do we realize that our clanging environment often produces shell-shock. Sounds of a more or less intermittent character cause irregularity of the heart rhythm, increase blood pressure, make our muscles more tense for action and our movements more energetic. As a consequence there is a greater wear and tear on the system, resulting in rapid fatigue and nervous exhaustion. Noise interferes very seriously with the efficiency of the worker. At first the worker becomes stimulated, then disturbed, excited, and irritable. His conduct changes and he is subject to loss of temper. Those engaged in brain work are prevented from deep and sustained thinking. In the attempt to overcome the effects of noise, great strain is put on the nervous system, leading to neurasthenia and psychasthenia. Even the digestion does not escape the harmful effects of disturbing noises. Continued loud noises striking the delicate mechanism of the ear cause impairment of hearing. Lesions of the internal ear develop, which manifest themselves as ear noises, dizziness, and headache. The years of profitable activity are shortened in those whose occupation exposes them to persistent loud noises.

Our capacity for adaptation deludes us into believing that surrounding noises do not influence us seriously. Noise causes a fear reaction which includes involuntary bodily changes affecting digestion and blood pressure. In

most urban centers man has reached a point in his conscious adaptation to noise resembling the complacent frog which can be boiled alive if only the temperature is raised by very slight degrees. It does not spare the frog's skin that he does not feel the water persistently becoming warmer, and it may not save our sanity that we do not notice noise any more.

KEY TO ADVERTISING SLOGANS ON PAGE 364

1. Cantilever Shoe.
2. Woodbury's Facial Soap.
3. Old Gold Cigarettes.
4. Victrola.
5. Fisk Tires.
6. Ivory Soap.
7. Durham Duplex Razor.
8. Newbro's Herpicide.
9. Maxwell House Coffee.
10. Steinway Piano.
11. Blue Jay Corn Plaster.
12. Carnation Milk.
13. Prophylactic Tooth Brush.
14. Morton's Salt.
15. Venida Hair Nets.
16. Packer's Tar Soap.
17. Eveready Flashlight.
18. Clicquot Club Ginger Ale.
19. Packard Motor Car.
20. Camel Cigarettes.

SUMMARY

Attending makes for clearer perceiving. Attention is directed by our interests, it is limited in range, it is short in duration, it is single by nature, it may vary in degree, and it is facilitated by certain conditions such as the size and the novelty of the stimulus.

Through perceiving we become aware of our surroundings. Perception is not a matter of passive reception but

an active process through which stimuli are interpreted and given meaning. The meaning depends on the set and the context. Judgments of space and time are made on the basis of various cues, often without our knowing just how we make the estimations. Observation is unreliable, a fact that is of fundamental significance in the psychology of testimony.

REMEMBERING AND ANTICIPATING

WHenever we bring back the past through recollection, or "picture" the future through anticipation, we are using our imagination. The phrase "using our imagination" implies that imagination is a thing that lies in readiness, awaiting the call to contribute its bit to the teamwork of mental life. Imagination, however, is not a thing, and we would avoid such a misconception if we used verbs instead of nouns. Thus, by substituting *imagining* for *imagination*, it becomes apparent that recalling and predicting, recognition and precognition, are all forms of *imagining*.

I. IMAGINING

Imagining is the mental activity through which we reproduce and reorganize past experiences. Thus, by representing to ourselves objects that are absent, we are able to liberate the organism from a dependence upon present sensory stimulation. Objects may be thought of, thought about, and reacted to imaginatively (implicitly) before explicit responses are carried out. In planning a house, for example, a person visualizes the structure in all its details, adding here and eliminating there, before the actual erection is begun at all. When the role of mind in the process of adjustment is taken as the point of departure, the significance of imagining becomes more and

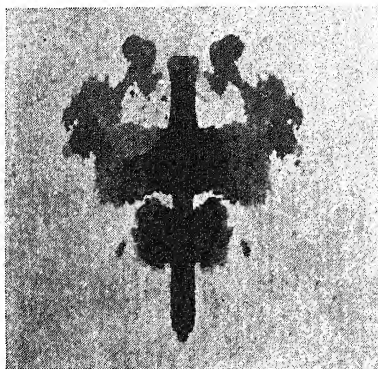
more impressive, for it is through this activity that the experience of the past can be applied in the anticipation of the future, and thus reactions can be planned in advance with reference to situations calling for adaptive responses (intelligence). Behavioristically speaking, imagining is a delayed reaction in the course of which implicit responses are rehearsed before their conversion into overt behavior.

We usually think of imagination as having reference to the future. Imagination may be the activity of memory, or it may be the activity of anticipation, or it may be a combination of the two.¹ When we recall a past experience, we imagine; when we pause to consider a prospective course of action, we imagine. When imagining has a backward reference in point of time, we call it remembering; when imagining has a forward reference in point of time, we call it anticipating. The individual, of course, is not always conscious of the time reference. He may, for example, recite the alphabet as he remembers it, without any definite awareness of a date in the past when he first learned his ABC's. The time reference exists, however, for descriptive or explanatory purposes, since imagining with reference to the past, even though the element of time may not appear explicitly in the consciousness of the rememberer, may still be properly designated as an act of remembering.

Anticipating proceeds in the light of what is remembered. Imagining which reinstates a past experience is sometimes called reproductive imagination; imagining which transcends the past is sometimes called constructive, or even creative, imagination. Thinking is imagining organized with reference to a project, and may involve both reproductive imagination and constructive imagination.

¹K. Gordon: "Memory Viewed as Imagination," *Journal of General Psychology*, 1937, 17, 113-124.

The role of imagining in supplying meaning to experience can be demonstrated by the ink-blot experiment.¹ What does the following figure mean to you?



Can you determine the sources of your interpretations?

The ink-blot test. The ink-blot test was first introduced in 1921 by the Swiss psychiatrist and psychoanalyst Hermann Rorschach. It consists of a series of 10 blots, selected, after experimentation, from a group of 60. The subject is shown the blots, one by one (time—usually unlimited) and he is asked to respond by telling and describing the things and ideas the ink-blot suggests to him. The diagnosis of personality by means of this test depends on the response patterns evoked by the stimuli; i.e., the ink-blots. The content, originality, perception of quality (form or color), and the manner of apperception,² as revealed by the response patterns, are significant in the interpretation of the results of the test.³

Imagining usually proceeds by the use of signs or sym-

¹See F. C. Bartlett: *Remembering: A Study in Experimental and Social Psychology*, 1932.

See also S. J. Beck: "Configurational Tendencies in Rorschach Responses," *American Journal of Psychology*, 1933, 45, 433-443.

²Apperception is the process of supplying the meaning.

³M. R. Hertz: "The Rorschach Ink-Blot Test: Historical Summary," *Psychological Bulletin*, 1935, 32, 33-66.

bols which represent objects or situations that are remote (absent). The role of symbolism in imaginal activities may be appreciated by a study of phantasy.

A. Phantasy. Phantasy is the activity of dreaming, indulged in while we sleep or while we are awake (day-dreams).

1. Dreams in Sleep. A dream is like a cartoon in that a situation is represented through meaningful symbols. Think of this cartoon as a dream. What is the meaning of the symbolism?

The most effective method of preparation for the task of interpreting dreams is to make a study of symbolism, in cartoons, in myths and folklore, in magic, astrology, and superstition. In analyzing cartoons, try to get the meaning without reference to the labels. You will soon discover typical symbols which can be readily recognized and interpreted.

a. The Freudian Theory. In ancient times, especially, dreams were looked upon as omens of the future. Joseph's interpretation of Pharaoh's dreams of the seven fat kine and the seven lean, for example, prophesied seven years of plenty and seven years of famine in the land, and enabled the ruler to keep the people from starving.

The Freudian interpreter views a dream, not as a por-



A DREAM

(Cartoon by R. Wilson Hammell.)

tent, but as a revelation of the character of the dreamer. How can the dream be explained in terms of the dreamer's personality?¹

Dreams were formerly looked upon as chaotic phantasies lying beyond the province of science. Freud insists that dreaming follows very definite mental laws, and that dream-analysis is not guesswork but a scientific technique.

Freud believes that the unconscious mind is seething with repressed desires which, in the waking life, cannot gain expression because the censor (conscience) blocks their entrance into the conscious mind. The censor represses the primitive wishes, and seeks by a constant vigil to "keep them in their places." The frustrated urges cause a profound unhappiness. The individual is unaware of the sources of his misery because the censor (resistance) conceals from the idealistic self at the conscious level those cravings which are evil according to the conventional code. Freud learned in his therapy that he had to unearth the longings of the Unconscious. But the censor stood in the way. The patient could not reveal the primal urges because they were hidden from his modest gaze. Then Freud discovered that the royal way to the Unconscious lay in dreams. It was through his therapy that he became interested in dream interpretation.

When a person is asleep, the censor is not careful in the inspection of immigrating wishes. Sleep, like a drug, produces a stupor; but still the censor is enough on guard to recognize undesirables, so that it is necessary for the immoral desire to disguise itself in order to slip by the censor. The disguise it assumes is the symbol.

The dream which we remember upon awakening is the manifest content, made up of symbols. To get at the meaning of the dream, the latent content, the interpreter must translate the symbols. The meaning derived will

¹See Sigmund Freud: *The Interpretation of Dreams*. 1923.

depend upon the understanding of symbolism. Since Freud takes every symbol to be sexual in its significance, it is obvious that the meaning attributed to the manifest content will be sexual. Every dream becomes a wish fulfillment, affording satisfaction for sexual wishes. Since dreams offer an outlet for suppressed desires, and since the sexual urge is the most suppressed of our desires, due to conflict with the conventional code, according to Freud, it is natural that dreams should be given a sexual meaning. We must appreciate the fact, in this connection, that the term *sexual* is used by Freud in the same sense as the German word *Liebe*. Sex, for Freud, therefore, signifies more than the usual connotation. The element of mental satisfaction is stressed, whether it is derived from sexual union, from self-love, from love for parents or children, love for humanity in general, or devotion to abstract ideas. Sexuality goes lower and also higher than the popular sense of the word.¹

The translation of the latent content into symbols is known as the dream work, performed in the course of sleep. The work proceeds by means of four characteristic mechanisms:

(1) *Condensation*. One element in the manifest dream content may represent several in the latent. A dream of a statue of Uncle Sam in the style of Venus de Milo would represent the complex fact that the United States was unprepared for war (unarmed).²

From the point of view of the analyst the mechanism of condensation is a convenient one, for it permits him to get more out of the dream than anybody would have suspected; indeed, he can derive as many meanings as he assumes have been condensed.

¹W. Healy, A. F. Bronner, A. M. Bowers: *The Structure and Meaning of Psychoanalysis*, pp. 2-4. 1930.

²See H. W. Frink: *Morbid Fears and Compulsions*, opposite p. 72. 1921.

(2) *Displacement.* Unimportant ideas in the manifest content may be the most important in the latent. The unimportance is a disguise, comparable to that assumed by the spy who appears stupid, or the "overgrown boy" who slouches in order to slip by for half-fare on the railroad train.

(3) *Dramatization.* Latent dream thoughts are represented to the dreamer in a dramatized form, expressed as in pantomime or moving pictures. The ideas are thus objectified in the form of images, mostly visual in nature. If sensory impressions do occur, they are comprehended by the dreamer as something outside himself. As in a play, events which really extend over a long period of time have to be represented in a few moments. The dreamer is always represented in the dream, and, usually, as the chief actor therein.¹

(4) *Secondary Elaboration.* The waking mind tends to alter the recollection of the dream by filling in the gaps and organizing the chaos into a coherent pattern. In describing the dream, particularly, the dreamer does some elaborating. It is the same propensity which gains expression in the familiar "fish story."

The dream fades rapidly upon the awakening of the dreamer. Freud would explain this phenomenon by stating that the resistance (censor) prevents the recollection of the disreputable incidents of the dream. However the phenomenon is explained, it is true that dreams must be recorded instantly upon awakening. If you wish to study your dreams, keep a pad and pencil at your bedside. To postpone the record until a more convenient moment, say, after breakfast, is to lose the dream forever.

b. *Criticism.* Some dreams belong to the category of wish fulfillment, such as the child's dream of possessing a toy, or the common adult dream of the death of some

¹Frink, *op. cit.*, p. 72.

enemy, in which the wishes seem definitely non-sexual. But there are other types of dreams. The anxiety dream is typified by dreams of missing trains, of failing in examinations, of climbing interminable mountains, and similar dreams which really are reflections of the dreamer's anxiety that he may fail in tasks which he has undertaken. The teleological dreams are those which suggest courses of action or solutions of difficulties. A masculine woman dreamed of a magic talisman which turned out to be a powder-puff, the idea of the dreaming mind being that more use of the feminine arts might aid this dreamer to relieve dissatisfactions in her life. Self-critical dreams are those in which some dream symbol represents the dreamer's fear of his own faults. A man dreamed of a donkey with weak and wobbly legs, representing the dreamer's recognition and criticism of his own feebleness of character.¹

The Freudian theory must be supplemented to embrace the various kinds of dreams. Perhaps the following suggestion will answer this need. Emotional experiences persist beyond the immediate situation arousing them, in the form of "a hangover." Anger, for example, can be felt hours after the intense stage has subsided. The effects of the glandular turmoil so stir up the body as to leave residual tensions. In sleep these tensions vent themselves, affording the system a cathartic relief. Imagination sets the stage, prepares the appropriate situation for the drama of a particular emotion. For example, if a person has driven his car home fast at night, involving some fright over a prospective mishap, the hangover of fear will be dramatized in a stereotyped fear situation—a burglar may appear at the window and point a revolver. Any internal stimuli or even external stimuli may be dramatized during sleep. The ring of the alarm clock

¹See V. E. Fisher: *Introduction to Abnormal Psychology*, pp. 385-393. 1929.

becomes a fire alarm, or the heartburn of indigestion becomes a bullet wound. A man dreamt that he was trying to cash a check. The teller asked him for identification. He took off his hat. "What else?" queried the teller. He took off his coat. "What else?" He took off his shirt. "What else?" He removed his trousers. "What else?" At this point he awoke to find the bedclothes had fallen on the floor. Imagination had furnished a situation to dramatize the sensations of exposure, and perhaps to fulfill an exhibitionistic wish, tinged with anxiety.

The interpretation of a dream requires an intimate knowledge of the entire career of the dreamer and of the particular emotional situation giving rise to the phantastic drama.

2. Daydreams. Thinking may be directed toward the solution of some problem, in which case it involves work, or it may be on pleasure bent, in which case it is more interested in indulging whims than in honest effort. The former may be labeled reality thinking; the latter, pleasure thinking. When thinking is not interested in reality, when it is not directed toward a constructive end, when it prefers the false to the true, it is sometimes called "autistic," a term coined by Bleuler. Autistic thinking is dominated by pleasure, in that it gives the illusion of aspirations fulfilled, obstacles removed, and impossibilities transformed into realities. Phantasy requires none of the painful effort necessary to actual achievement.

Real love is beset with quarrels and misunderstandings, but such is not the case with the amorous delights of the daydreamer. In a letter to *Picture Play*, a prize fan writes:

It makes me very angry when I hear people say that the movies exert a bad influence. Of course, there are a few exceptions, but for the most part the movies have no trace of

immorality and I think they are, on the whole, productive of good taste; indeed, if taken in the right spirit, they can cause their audiences to lead nobler and more virtuous lives.

I will show you what I mean. My hero is Ramon Novarro. To me he is the ideal man. His beautiful bronzed body is like an ancient god's, his charming, cultured manners reminding one of an Old-World grandee's *savoir-faire*.

When I first saw him it was in silent pictures, when no vehicle given him was worthy of his beautiful presence. Those must have been unhappy days for dear Ramon, when his genius was so vilely cramped by the limitations of his everyday human associates. He could portray the braggart perfectly, and the lover sublimely, but he was not given the chances he deserved. Then came "The Pagan"! Never will I forget the sight of his splendid lithe form. Ah, Ramon, since that beautiful day your clothes have always seemed to hamper you.

I may seem a bit extreme to those who do not feel about Ramon as I do, but one cannot control these things, so one might as well admit them.

Concluding that a great soul like Ramon's must have a beautiful faith, like so many others who love him, I have entered the church to which he belongs, and I am now a Catholic.

I have also, as so many of us have done, taken up the study of Spanish, that I might be in closer communion with him.

You now see what I meant in the beginning of my letter. I feel that my life is more beautiful now and my thoughts run deeper. I have very mystic moods. Ramon, unwittingly, has led me to a higher plane where coarseness is eliminated.¹

The girl who reads the photoplay magazines is really daydreaming and when she finds no Prince Charming among men with feet of clay, she clings to her "dream men," even as the woman above who went "just mad over Ramon."

The trouble with the truth is that it is mainly uncomfortable and often dull. Building castles in Spain, chasing rainbows, and blowing bubbles offer an escape from harsh reality. Every daydream is more interesting

¹*Picture Play*, March, 1931. By permission of *Picture Play*.

to us than the reality which is contemporaneous with it. Through phantasy the individual forsakes the actual world. There the danger lies, for the individual is apt to lose contact with the life about him—he reaches a state of ecstasy whence he cannot “come down to earth.” Phantasy may be so alluring as to diminish interest in real achievement. Fictions tend to dull the sharp edge of reality. It is no use dreaming about the way things ought to be, since the retreat into phantasy makes reality much more awful to bear.

For some people daydreaming provides the easiest escape from the boredom of a dull occupation. Factory workers on monotonous jobs daydream a great deal during their labors.¹ Workmen assigned to tedious and mechanical tasks sometimes invent games to break the routine. Elevator operators, for example, gamble with themselves regarding the floor numbers appearing on the call board. Thus an operator may wager that a call from the third floor will come before he reaches the first, that the fifth will call “up” before it calls “down,” and that the call on the ninth will be a woman. “One day,” says an operator, “I started from the top floor and got a call from the eleventh. Picked up a passenger and got a call from the tenth. Got that one and then there was a call from the ninth. That happened all the way down!” That had been a red-letter day in the life of an elevator operator!²

The study of a person's daydreams affords a deep insight into his personality. Phantasies reveal dominant interests which the individual himself may not clearly discern.³ Adler finds a wealth of material in daydreams

¹W. Williams: *What's on the Worker's Mind. By One Who Put On Overalls to Find Out.* 1921.

²M. Panzer: “Demonotonization,” *Esquire*, November, 1936.

³See G. H. Green: *Psychoanalysis in the Classroom.* Second edition, 1923.

which give him a clue to the goal in life around which a person's various activities are organized. Because phantasies are so intimate a part of himself, an individual is usually reticent in regard to them. The egoistic nature of daydreams attaches shame to their exposure. To bare your thoughts, your dreams of fame and fortune, is to expose your soul with shocking immodesty. "A penny for your thoughts" is not enough of an inducement.

Daydreams are a revelation of temperament. There is the "conquering hero" type of dream, in which the individual catches a forward pass and runs for the winning touchdown. Of such is the stuff of fairy tales with the poor little girl coming into glory in the last scene of the drama. The conquering hero, under the influence of his reveries, is as intoxicated as the drunkard who, under the influence of alcohol, "can lick any man in the county."

A person of masochistic temperament prefers the "suffering hero" daydream. His worth unappreciated, he "goes out to the garden to eat worms." He may dream that he is dead, and that people throng the cemetery at his funeral, remorseful for the way they abused him while he was alive. A child is apt to give way to such an orgy of self-pity after he has been spanked for some misdemeanor, especially if he feels that the punishment has been unjust.

Many individuals draw subconsciously while they are engaged in talking or listening. This sort of scribbling has come to be known as "doodling."¹ It is a form of automatic drawing. Tablecloths, menu cards, theater programs, and telephone directories are favorite media for this sort of creative self-expression. Some hotels in an effort to prevent scribbling on tablecloths now supply

¹From the motion picture, *Mr. Deeds Goes to Town*. Adapted from Clarence B. Kelland's story, "Opera Hat," which appeared serially in the *American Magazine*, starting in April, 1935.

pads of paper on their dining tables with the inscription, "If you want to make a note—HERE'S THE PAD."

Arundel has collected "doodles" of famous persons. The accompanying sample is one of the creations of Senator James J. Davis, former Secretary of Labor.



DOODLER:—JAMES J. DAVIS

The fine sense of humor possessed by Senator and former Secretary of Labor Davis comes out in his doodles. Here is a doodle created during luncheon in the Senate restaurant. Known to his friends as "Puddler Jim," the Pennsylvania Senator subconsciously drew a sketch of himself and his "house" on the back of a menu. At the time he was discussing the national politics with a group of friends.

Analysis: Modest, proud of his personal achievements, owner of a sense of humor that stands him in good stead, and possessed of a good understanding of people.

(From *Everybody's Pixillated*, by Russell M. Arundel. Reprinted by permission of Little, Brown & Company.)

Phantasy may be investigated by the ink-blot test, by dream-analysis, and by thematic apperception, techniques that have already been described. Other methods include

the *musical-reverie test* in which the subject is instructed to weave the images that come to him, while listening to music, into a plot or allegory; the *odor-imagination test* in which the subject is told to invent a short anecdote when the experimenter presents some odor, like ginger or after-shave lotion; and the *dramatic-production test* in which miniature stage properties, animals, and little figures (about $1\frac{1}{2}$ inches high) are arranged into a dramatic scene, the experimenter observing the rehearsal through a one-way screen and later serving as the audience for the performance of the play.¹

B. Imagination and Emotion. It is common knowledge that as a man thinks, he tends to feel, and vice versa. Ideas and emotions are intimately interrelated. It is of vital importance to a man's affective health to guard his mind against those thoughts which are apt to be translated into unhappy emotional consequences.

One of the most potent influences upon imagination in our time is the movie. The vividness of the motion picture makes its appeal particularly effective, but unfortunately that appeal is often seriously unwholesome. The importance of this fact has led to an extensive research. The average weekly attendance at all motion-picture theaters in the country came to 77,000,000 in 1929.² Of these 77,000,000, about 28,000,000 were under 21; 11,000,000 were thirteen years old or younger, and 6,000,000 were seven years old or less. The average exposure of the child to the movies is about two hours. That is about twice the exposure of the child to Sunday school—if he goes to Sunday school at all. Many of the

¹See H. A. Murray: "Techniques for a Systematic Investigation of Fantasy," *Journal of Psychology*, 1937, 3, 115-143.

See also H. A. Murray, et al.: *Explorations in Personality*. 1938.

²The figure for 1937, according to the *Film Daily Year Book for 1938*, is 88,000,000. The same organization reports a figure of 70,000,000 for the first six months of 1938.

younger children sit through the same program two or three times. It may be set down as an established fact that "a movie a week" is impressing itself upon our children's imaginations. Many of the pictures which they absorb deal with the thrills of crime and illicit love. Values are instilled which undermine the training provided in the home, church, and school. Parents may endeavor to teach their children to be unselfish, courageous, honest, hard-working, faithful, and kind, but they cannot compete with the smart, sophisticated, daring, clever, stupendous, passionate, and dazzling ideals emanating from Hollywood. Tests have demonstrated that children retain about 70 per cent of the material portrayed in the movies. More people will probably see the next Norma Shearer release than have seen Shakespeare's "Hamlet" in the three hundred years since "Hamlet" was written. The movies arouse emotions without any particular regard as to whether the consequences will be elevating or degrading. The situation, indeed, is a serious one, meriting careful attention.¹

Charcot and Janet, the famous French psychiatrists, called attention to the importance of ideas in illness.² The nature of a disorder will sometimes be determined by what the person thinks (imagines) is the matter with him. Goldenrod is unjustly blamed by hay-fever sufferers for their ailment. Some hay-fever sufferers aver, "But I start sneezing if I only so much as see a bunch of goldenrod." That is just it. Most cases of that sort are started by just seeing the suspected plant: the sneezes are psychological

¹See especially, R. C. Peterson and L. L. Thurstone: *Motion Pictures and the Social Attitudes of Children*. 1933.

See also F. K. Shurtleworth and M. A. May: *The Social Conduct and Attitudes of Movie Fans*. 1933.

Also W. S. Dysinger and C. A. Ruckmick: *The Emotional Responses of Children to the Motion-Picture Situation*. 1933.

Also C. C. Peters: *Motion Pictures and Standards of Morality*. 1933.

²See P. Janet: *The Major Symptoms of Hysteria*. Second edition, 1920.

sneezes. The patient gets started by ragweed or some other real troublemaker, mentally associates goldenrod with his trouble, and then gets a prolonged sneezing spell just by looking at it and feeling sorry for his poor nose. Try to get some pollen out of a bunch of goldenrod. You will find that you have to shake and thrash the flowers about to get the golden dust to come loose. Then try ragweed. The merest touch will send puffs of its pollen drifting into the wind. In spite of its general innocence, goldenrod may be the guilty plant in a very few cases. But it should be presumed innocent until proved guilty. Many persons believe that fruit juice causes milk to curdle in the stomach, thus producing indigestion. They do not know that there are enzymes in the stomach, anyhow, waiting to curdle the milk as a step in the normal digestive process. The misconception of the bodily functions may produce indigestion, through conscious interference with an habitual process which works best when it works automatically. Wrong ideas encourage inappropriate emotions, which, in turn, mean misdirected energy and lack of harmony within the personality, resulting eventually in maladaptation to the social environment.¹ An extreme case was the boy who refused to exercise because he was afraid of spontaneous combustion. Right thinking bears a vital relation to sound health.

C. Types of Imagery. Francis Galton, the famous British scientist, became interested in the study of mental imagery, particularly of the mode of visual presentation, and he began an inquiry to ascertain the essential differences between the mental operations of different men.² The investigation of this problem by Galton and, since his time, by others has revealed the fact that people differ in

¹See J. A. Jackson and H. M. Salisbury: *Outwitting Our Nerves*. Second edition, revised and enlarged, 1932.

²Francis Galton: *Inquiries into Human Faculties*. 1907.

the kinds of imagery which they employ in thinking of the same situation. One sort of imagery may predominate in a given individual; one sort of imagery is more vivid than others, although correlation, not compensation, being the rule, a person who excels in one kind of imagery is apt, generally speaking, to excel in other kinds as well.

Test yourself. Ideate each of the following experiences and rate them:

1. As vivid as the actual experience.
2. Very clear.
3. Moderately clear.
4. Not clear but recognizable.
5. Vague.
6. So dim as to be hardly discernible.
7. No image at all.

Visual imagery.

The face of a friend.

A rose.

The American flag.

Auditory imagery.

The tune of the Blue Danube Waltz.

The chirp of a cricket.

The voice of your father.

Gustatory imagery.

The taste of beefsteak.

Grapefruit.

Salt.

Olfactory imagery.

The smell of camphor.

Old Golds.

Kerosene.

Cutaneous imagery.

The feel of wet soap.

The prick of a thorn.

A pebble in the shoe.

Kinesthetic imagery.

The swing of a golf club.

Stooping over to pick up an object.

Threading a needle.

Organic imagery.

A headache.

A full stomach.

A fever.

1. Description. Imagery may be classified, as in the above experiment, according to the various modes, such as visual, auditory, and so forth, or it may be described under the more general categories, concrete and verbal. In concrete ideation, a person "pictures" the object itself, while in verbal ideation he thinks of the words which symbolize the object. Thus you may think of a rose by seeing in your mind's eye a pink flower (concrete visual), or by visualizing the word r—o—s—e— (verbal visual), or by hearing the word as it is spoken (verbal auditory), or by speaking it yourself (verbal vocal motor), or by writing it (verbal manual motor). There are many varieties and combinations of concrete and verbal imagery.

Visual images are extremely vivid in some persons. A painter dismisses his model after half an hour's sitting and then paints her from memory. Galton tells of a man who habitually worked out sums by aid of an imaginary slide rule, which he set in the desired way and read off mentally. A statesman assured Galton that a certain hesitation in utterance which he had at times was due to his being plagued by the image of his manuscript speech with its original erasures and corrections.

When imagery is predominantly visual, another mode of presentation must be translated into visual terms before the situation can be grasped adequately. In listening to the description of a football game over the radio, such a person is likely to convert the verbal auditory images into

concrete visual images. It is most difficult for such an individual to transact business over the telephone since no scope is given his visualization. He remembers a melody not in terms of tones, since his auditory imagery is deficient, but in visual images of the notes on the music sheet or of the keys to be played on the piano keyboard. If a foreign tongue is spoken to him, he must go through the same laborious procedure of translating the auditory images into visual ones before he can grasp the meaning, since unfortunately he has probably learned the language in the classroom through reading. A prominent psychologist ideates the German language in vocal-motor and auditory terms because he learned it by conversation in Germany, whereas he ideates French in visual and manual-motor terms because he learned it in the classroom.

An extraordinary sort of visual imagery has been investigated in recent years—eidetic imagery—which is a special concrete visual imagery.¹ In a typical experiment, a silhouette picture with a number of items is exposed to the view of the observer who fixates it for 15 seconds. The picture is presented against a gray mat for a background. The picture is removed and the observer stares at the gray mat. If the observer is an eidetic, he will see the picture on the background, and will be able to describe the most minute details of the scene, such as the precise number of buttons on a pedestrian's jacket, or the number of whiskers on a cat's lip.

Eidetic images differ from after-images in several respects. The subject of the experiment does not fixate a particular spot or keep his gaze steady, as he must do to obtain an after-image. He may let his eyes roam over the picture at will. Erroneous details are sometimes inserted into the image, under the influence of the ob-

¹The most important investigator of eidetic imagery is E. R. Jaensch. See his book, *Eidetic Imagery*. 1930.

server's interests. The eidetic image, also, may last over a considerable period of time.

Eidetic imagery is very rare in adults. About 5 per cent of children between the ages of 10 and 15 possess the eidetic capacity. The prevalence of *eidetikers* depends on locality, since a deficiency of calcium in the diet seems to be conducive to this special form of imagery.

Eidetic imagery enables children to repeat their adaptive responses to the situation represented until satisfactory adjustments are effected. A child's reaction to the first presentation of a situation is incomplete. He looks at the same picture book repeatedly, and wants the same stories told over and over. Eidetic imagery enables the child to review various aspects of a situation until he gradually gains a comprehension of the full meaning of the whole. By the time he has reached adolescence, he has learned the requisite modes of adjustment, and the eidetic imagery, no longer a necessary aid, declines.¹

2. Applications. A boy of thirteen was trying to draw a map of Greece. Although he had made a thorough study of the map, his outline drawing was very inaccurate. A psychologist, surmising that the boy belonged to the motor type, had him trace the coast-line with his finger, at first in sections and then as a whole. The boy was then able to reproduce the map without difficulty.

A boy was sent to Dr. Grace Fernald, a Los Angeles psychologist, with a note stating that he was feeble-minded. She tested him and found him normal in everything but reading. She wrote "normal" on his card. Later the boy returned with a note: "If you think this boy is not feeble-minded, suppose you teach him something." For three months the staff at the clinic tried to teach him to recognize words, but to no avail. One day he

¹See G. W. Allport: "Eidetic Imagery," *The British Journal of Psychology*, 1925, 15, 99-120.

was shown a card with the word *land* on it. Instantly he said, "That's *land*." Investigation revealed that the day before Dr. Fernald had in desperation written the word on the board and had helped the boy trace the word with his fingers. Further trial showed that every word he traced *as a whole* he could later recognize. After extensive training the boy returned to school where he made eight grades in the next five years. Learning to read by means of this kinesthetic technique has helped many children formerly considered defective because of their inability to recognize words.¹

A student who is visually minded will find that a well-ordered notebook with ample margins and colored underlining facilitates cramming considerably. The habit of note-taking, however, is a vicious one. The notebook becomes a substitute for the understanding. When the average student attends a lecture, he writes down what is said and then reads his notes to absorb the meaning of the discourse—a most circuitous and cumbersome method. A college man trained himself to think while he was listening, and to remember what he heard. He saved himself a lot of dull labor.

If a person has a vivid auditory imagery, he grasps material most easily if it is read to him. If the verbal motor (kinesthetic) imagery is superior, he learns best by reading out loud or reciting his lessons out loud. Some people think best out loud, as the lecturer does whose ideas come with facility when he is speaking. Such a person would do well to dictate his books, while other individuals can think most effectively while they write.

Now that we have made a study of imagery, we are prepared to investigate the two fundamental kinds of imagination, reproductive imagination (memory) which reinstates the past, and constructive or creative imagi-

¹A. E. Wiggam: "Touch, and Lo!" *Today*, October 17, 1936.

nation (anticipation) which points its interest primarily to the future.

II. REMEMBERING

It is through remembering our past successes and failures that we are able to profit by experience. Memory furnishes the data for anticipation. Thus progress is rendered possible.

Some persons think of memory as a storehouse; some persons think of it as a special faculty. The mind, however, is not organized on the department-store plan. The mind works as a whole. When the mind is pointed toward the past, the *individual remembers*. In the act of remembering, the mind utilizes experiences accumulated through all of its various activities.

There is no general memory. There are only a number of special memories—memories for numbers, names, tones, locations, and so on. A person may excel in some and be deficient in others. To use more exact diction, a person remembers some experiences better than others. "A good memory" means a person remembers many sorts of things well.

Lawyers seek to discredit a witness's entire testimony by showing that he cannot remember some things accurately. It is unjustifiable, however, on the basis of psychological findings, to rule out a person's testimony concerning a crime by demonstrating that he has a poor memory for things in general.¹

An individual learns, retains, recalls, and recognizes by organizing experience according to definite sorts of relations. The student who is preparing for an examination can aid his memory immensely by organizing his notes

¹S. H. Britt: "The Learning-Remembering Process (A Reply to Professor Cason)," *Psychological Review*, 1937, 44, 462-470.

R. M. Hutchins and D. Slesinger: "Some Observations on the Law of Evidence—Memory," *Harvard Law Review*, 1928, 41, 860-873.

before he settles down to the grind of memorizing them. The very process of organizing is worth hours of cramming.

A. Four Conditions for Efficient Remembering. A good memory depends upon efficient attending, perceiving, and imagining—upon the organization of four fundamental tendencies:

1. Impressional. The strength of the initial impression influences the length of time the experience will be retained. A poor memory may be due to poor attention.

To remember well, a person must first be a good observer. He must know what to look for and note the essentials of the situations by concentrating his attention upon them. A vivid impression is vital. A correct preparation which sets the individual for observation facilitates the perceptual process.

2. Associative. The linkage between experiences is strengthened by repetition of the association. The cross-examining lawyer instructs the witness to think of one incident in order to bring back, through a connection, the material he wishes the witness to recall. Remembering is facilitated when a person connects what is learned in a meaningful way with his own intimate experiences. Association, as we shall see later, is the real key to memory.

3. Determining. Have a person read a passage with the definite purpose of ascertaining whether he can pronounce every word correctly. When he completes the reading, ask him to repeat the account from memory. He will do poorly because he was not set to remember. One wholesome function of a school examination is that it reinforces the set to learn and to recall by arousing "interest." Interest or set functions as a determining tendency.¹

¹Refer to the discussion of *set* on pp. 354-358.

See also James L. Mursell: *Streamline Your Mind*, Chap. 2, "The Great Essential: The Will to Learn." 1936.

Also J. H. Moore: "The Role of Determining Tendencies in Learning," *American Journal of Psychology*, 1936, 48, 559-571.

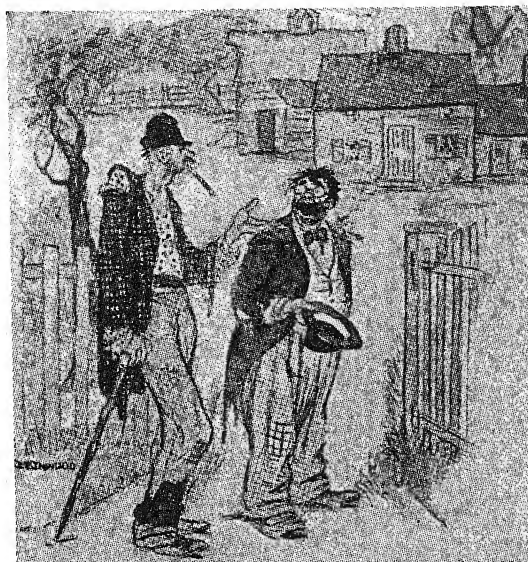
An efficient memory depends upon the wise selection of the material worth remembering. Selection is determined by the *Aufgabe*. The brain has been described as an organ of forgetting. The wise person does not attempt to remember everything he sees or hears. Encyclopedic learning may be a burden rather than an advantage. Memory is often a simulator of intelligence. According to Ripley, William Lyon of Edinburgh can repeat from memory the entire contents of a newspaper after reading it over once. Yes, but who wants to do it?

A person does not remember names because he has no desire to do so. Lacking the intention, he does not even heed the name when he is introduced. Interest is essential to effective remembering.

The importance of intention or set for learning has been widely recognized. A person has a poor memory, often, because he does not desire to remember what he is assimilating. A student, in preparing for an examination, is often annoyed by the irksomeness of his task to such a degree that there is generated, if it is not already present, an aversion for the subject, which renders facile recall unlikely. The student hopes to forget it all as soon as the test is over, but alas, too frequently he does not time his forgetting accurately and his memory fades too soon. What he needs is an interest which will give him an incentive.

If the student of psychology could appreciate the value of the subject to the degree depicted in the cartoon on the following page, his learning would be considerably facilitated, since a subject is more easily learned by those who see its usefulness.

For the best results observation must be carried on with the deliberate intention of grasping the impressions not merely for the moment, but of retaining them permanently. If we make a special effort to notice things



First Hobo: Remember your selling argument when you tackle that prospect up there, Bill. It's psychology that counts.

Second Hobo: Check!

(Drawn by G. B. Inwood.)

clearly for the sake of later recall, we actually retain them more readily. When we want to remember, we assume a certain attitude toward the observation. In the first place, we dwell upon the impressions longer than is necessary for mere apprehension; we notice the impressions exactly. Secondly, we make a stronger effort to bring them into relation with one another. The will to remember what is observed involves a characteristic attitude especially favorable to the formation of associations among the various aspects of experience, and these connections facilitate remembering. While the intention to remember is important, it is no guarantee of accurate memory, as any student who is struggling with an examination can bear witness.

Interest is an important factor in memory, as Bartlett discovered in his study of the Swazi natives of Africa. He found that the Swazis displayed remarkable powers of remembering only when the experimental tests concerned cattle, for their whole life centers in the possession and care of cattle. One herdsman gave him a minute description of all the cattle purchased by his owner a year previous, with an accurate account of all the prices involved in the transaction. The herdsman was present when the cattle were bought, he drove them to the farm, and he had seen no more of them. There were only two trivial errors in his entire description. Herds and all dealings concerning them are of tremendous social importance among the Swazis.¹

It should be noted, in connection with memory, that prior experience is very important in determining how and what we perceive now. The determining tendencies are built up through the learning processes, since education develops new interests. New sets are established which serve to control the course of associations in line with the dominating concerns of the individual.

4. Perseverative. Memory depends upon the fact that impressions "persevere." If a person leaves a problem unfinished to devote himself to another piece of work, thoughts of the uncompleted task will keep intruding. The man who begins thinking of three-letter words that can be derived from Toothpaste will toss all night in his sleep as new words dawn upon him. A tune may persist in running through the head despite all efforts to banish it. The teacher tends to give a pupil the same mark throughout the semester. A phrase will recur time and again. On a certain day, one finds oneself saying "You said it" in response to every remark.

¹See F. C. Bartlett: *Remembering: A Study in Experimental and Social Psychology*, pp. 248-251. 1932.

B. Conscious and Unconscious Memory. A clear understanding of the mind necessitates a recognition of the distinction between conscious memory and unconscious memory.

Unconscious memory is illustrated by bodily immunity to disease. Immunity is rendered possible by the fact that the body "remembers" pathogenic organisms it has formerly defended itself against; because of these earlier encounters the bodily tissues are sensitized against this particular poison, so that should the organism again attempt to enter the body, the defensive mechanisms are immediately mobilized and the organism destroyed before it can multiply in the body.

Conscious memory, in contrast to unconscious memory, is characterized primarily by the experience of "againness" which we designate as recognition. Psychological memory involves meaning. An event is recalled and recognized by its meaning; in other words, by an appreciation of the associative connections between events. The student who understands (the meaning of) his lesson is more apt to recall it than the student who memorizes the material mechanically. Memorizing on a mechanical level is known as rote memory, and it is much inferior to logical memory where meaning is taken into account. Rote memory is more akin to the physical memory exhibited by the egg which remembers how to turn out a complete chick.

memory

C. Rote and Logical Memory. Rote memory is involved when a person learns without any grasp of meaning, as in the case of a young child who memorizes a classic poem to recite at a Christmas celebration. Logical memory is based on the comprehension of meanings, as exemplified in the student who learns to demonstrate a geometric theorem through understanding in the proof the successive stages which culminate in the Q.E.D.

Ebbinghaus invented the nonsense syllable as a medium for testing memory. The nonsense syllable consists of two consonants with a vowel between, meaningful combinations being excluded. Since the syllables are practically meaningless, every subject starts at scratch, as it were, and lists may be constructed which involve a uniform degree of difficulty. Meaningful words, on the other hand, carry more meaning for some persons than others, thus involving an unfair advantage. The nonsense syllable tests the bare capacity of memory. The method, of course, tends toward artificiality, since in our everyday experience we remember meanings, and the superior memory belongs to the person who can avail himself of a host of associations to facilitate the remembering process.¹ To put it facetiously, we do better to forget nonsense, anyway.

The memorization of a list of words or syllables is tested more scientifically if the words are exposed one at a time by a tachistoscope, thus preventing the observer from glancing back over the list. With the single exposure it is possible to record the exact number of repetitions necessary for complete learning. If the observer can run back over the list as he wills, there is no way of telling how many repeated observations of the material he makes.

Meaningful experience is much more easily remembered than nonsense. In learning a passage it is very important to grasp the meaning. Mere repetition does not strengthen bonds much. The addition of "belongingness" (meaning) is necessary. "Mere sequence with no fitness or belonging has done little or nothing," says Thorndike in regard to an experiment on learning. "With only a fourth as many repetitions the greater belongingness re-

¹E. L. Welborn: "Logical Learning and Retention: A General Review of Experiments with Meaningful Verbal Materials," *Psychological Bulletin*, 1937, 34, 1-20.

sults in much greater strengthening, producing nearly twice as many correct responses."¹

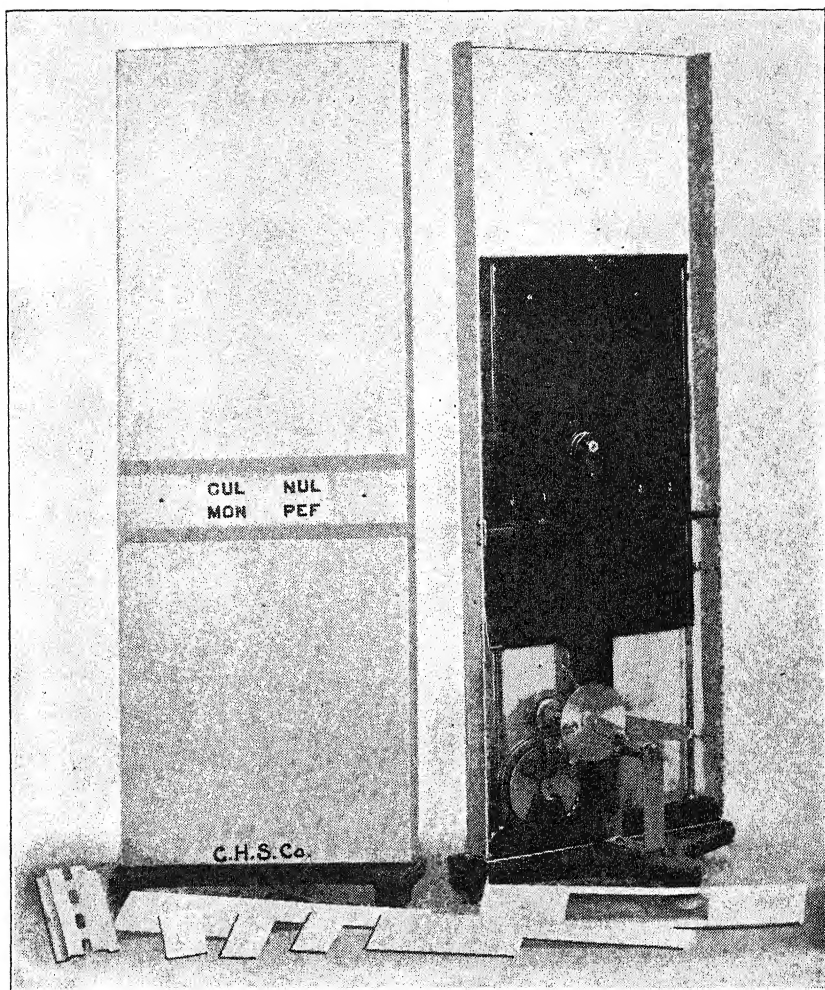
Mnemonic devices approximate the nonsense of the nonsense syllable, stressing rote memory. Many people cannot determine the number of days in a month without running through the jingle, "Thirty days has September." Resort to such mnemonic devices may save time for the moment, but in the long run it is poor economy. It would be much better for children to learn the number of days in each month by means of arithmetical problems involving the calculation of dates. It would take longer to learn the calendar in this way but it would be a saving in the end.

Memory experts train themselves to remember names by mechanical links, such as remembering Hicks, the shoe manufacturer, by recalling that "Hicks sells kicks," but they forget other matters of more importance, as did a memory expert who failed to appear for his scheduled speech because, as he explained, the engagement had simply slipped his mind.²

Rote memory may be tested experimentally by the memory span method. The memory span is the longest series of items which the subject is able to reproduce correctly after a single presentation. Digits are ordinarily used as the material. The presentation may be visual or auditory. In the visual method the experimenter presents a series of cards upon which the digits are printed, ranging in span from four to twelve digits. The upper limit may be set at fifteen if the subjects are college students. The experimenter first presents the card with four digits for four seconds. The subject is instructed that he will be required to reproduce the digits in their correct order. When the card is removed, the subject writes down or

¹E. L. Thorndike: *Human Learning*, pp. 19, 23. 1931.

²The *Boston Herald*, July 22, 1932.



**JASTROW'S MEMORY APPARATUS—USED FOR SERIAL
EXPOSURES**

(Reproduced by courtesy of the C. H. Stoelting Company.)

gives orally all of the digits he can remember. Each card is exposed for as many seconds as there are digits printed on it. The time is controlled by a metronome. In the auditory method, the digits are read at a rate of one per second and the subject is instructed to wait until the digits are all read before he writes down the items or gives them orally.

Logical memory may be tested experimentally by requiring the subject to reproduce a narrative which he reads or which is read to him. The reproduction may be oral or in writing. The score is computed in terms of the number of ideas correctly remembered, the distinct ideas being separated by slanting lines. In the Stanford-Binet Intelligence Test there is a test for logical memory in which the child is given thirty-five seconds to read a passage. He is to read it with not more than two mistakes in the reading and to recall at least eight ideas.

New York./ September 5th./ A fire/ last night/ burned/
three houses/ near the center/ of the city./ It took some time/
to put it out./ The loss/ was fifty thousand dollars,/ and
seventeen families/ lost their homes./ —In saving/ a girl/ who
was asleep/ in bed,/ a fireman/ was burned/ on the hands.¹

D. The Four Major Aspects of Remembering. 1. Learning. Learning involves the modification of activity through experience. Learning may be sensori-motor as in the acquisition of a motor skill; it may be perceptual as in the development of observational capacities through which new means of apprehension are achieved; it may be ideational as in the improvement of ability for problem-solving and the cultivation of insight for meanings; or it may be appreciative as in the attainment of a new sense of values. In all its various forms, learning is fundamentally a process of change.

¹Reprinted by permission of, and by special arrangement with, Houghton Mifflin Co.

Learning is not remembering, but a preparation for remembering. As such, it can be studied most conveniently as one aspect of remembering.

a. *Trial and Error.*✓ According to one group of psychologists, learning proceeds by the trial-and-error method. A person who is faced with a baffling problem is like a man lost in the woods—he darts here, he darts there, until finally, by chance, he finds his way out.✓ Many mistakes are made that will gradually be omitted in repeated trials until the reaction is perfected. In the weeding process, the correct response is “stamped in” because the result is satisfying, while the false step is eliminated because the consequence is annoying.¹

The method of trial and error may be illustrated by a test of sensori-motor learning, in which the subject is required to trace a star that is visible to him only in a mirror. Because of the reversal of his customary movements, the subject in “feeling his way along” must adapt himself by experimenting with a variety of motions until he learns the knack of it. Learning is measured by the number of trials necessary before the subject is able to keep his pencil on the outline of the star he is tracing.²

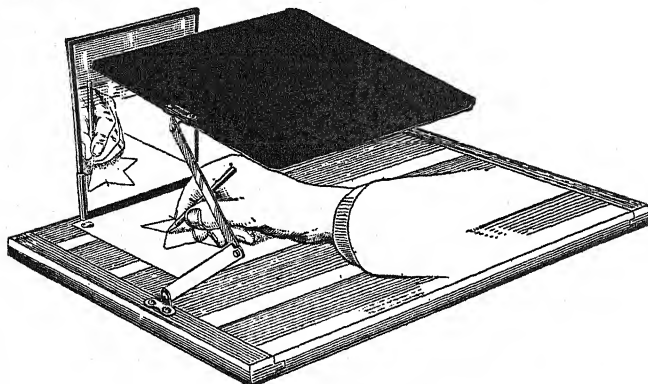
In a similar manner, an animal is supposed to escape from a cage by making movements blindly until a latch happens to be struck which releases him from captivity.✓ After a number of repetitions, the correct movement will be made sooner—the animal has learned how to get out of the puzzle box. The reaction is not deliberative. The animal learns by doing, not by observing what he's doing. There is no conscious direction. The behavior is impul-

} 1. animal
2. puzzle box

¹Thorndike has modified this Law of Effect by recognizing that false steps are not eliminated because of the annoying aftereffect of a connection; indeed, a wrong response once made is more potent than any punishment that may accompany it. See E. L. Thorndike: *Human Learning*. 1931.

²See H. E. Garrett and M. R. Schneek: *Psychological Tests, Methods, and Results*, Part I, p. 102. 1933.

sive rather than reasoning. Human beings are said to solve their problems in the same fashion.



MIRROR DRAWING

(Reproduced by courtesy of the C. H. Stoelting Company.)

Thorndike, who is sometimes represented as having formerly espoused this view, now denies that responses are random in the sense that any one person's response is as likely to occur as any other person's in a given situation. ✓ He definitely disclaims such a view when he states that "the great bulk of a child's motor behavior and learning is determined by definite abilities, wants, interests, and the circumstances of his life."²]

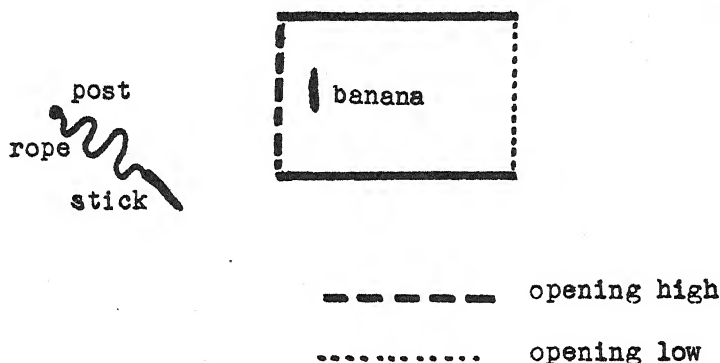
The point of view that learning is a fortuitous process by which successful responses emerge through chance selection has no wholehearted advocates. The representation of such a point of view has served chiefly as a straw man created for purposes of attack and the joy that comes with the demolition of the enemy.

b. Insight. ✓ The trial-and-error method is vigorously opposed by a number of psychologists who maintain that

¹E. L. Thorndike: *Animal Intelligence*. 1911.

²E. L. Thorndike, *et al.*: *The Psychology of Wants, Interests, and Attitudes*, p. 13. 1935. By permission of D. Appleton-Century Company, Inc.

the higher animals, such as cats, apes, and human beings, show some insight in the learning process.⁷ Adams put cats in puzzle boxes, just as Thorndike did, and observed their behavior. On the basis of his data, Adams concluded that the cats wanted something, and that they showed foresight in attaining their goal.¹ Adams' hypothesis concurs with that of Köhler, who found that the apes he studied were not fumbling blindly for a chance solution, but were striving intelligently to achieve a goal which had been foreseen. For example:



The problem could only be solved by pushing the banana across the cage with the stick to the side of the bars and then running around to that side and seizing the banana by the hand. This the ape suddenly did after a period of inactivity, when the solution suddenly dawned on him. Insight was required in that the ape had to anticipate the relationship between a new location of the fruit and its availability at that position. No amount of random movements would have resulted in procuring the banana.²

¹D. K. Adams: "Experimental Studies of Adaptive Behavior in Cats," *Comparative Psychology Monographs*, Vol. 6, No. 1.

²W. Köhler: *The Mentality of Apes*, p. 264. 1925.

Accordingly, human beings also learn with insight. They know what they are trying to do, at times, and then a sudden insight reveals the way the task can be accomplished. Learning is not a blind mechanical process but a mental activity in which the resources of the mind are brought into play to achieve the goal in view. Trial and error are involved in the struggle for a solution, but the whole story requires the recognition of an additional factor, insight, which guides the activities to a successful completion.¹ The experimental sorting takes place, but it may be intelligently directed.

The controversy between the proponents of the "trial-and-error" and "insight" theories has called forth a telling comment from Bertrand Russell. He points out that the contradictory conclusions may be traced to the different temperaments of the various experimenters:

One may say broadly that all the animals that have been carefully observed have behaved so as to confirm the philosophy in which the observer believed before his observations began. Nay, more, they have all displayed the national characteristics of the observer. Animals studied by Americans rush about frantically, with an incredible display of hustle and pep, and at last achieve the desired result by chance. Animals observed by Germans sit still and think, and at last evolve the solution out of their inner consciousness.²

The role of insight, of course, is clear in experiments involving ideational learning. Substitution tests require the subject to substitute one set of characters for another according to instructions provided in a key. Writing a paragraph in code is one form of such a test.³ A Rational Learning Test devised by Peterson sets the subject the

¹K. Koffka: *The Growth of the Mind*. 1924.

²B. Russell: *Philosophy*, pp. 29-30. 1927. By permission of the Open Court Publishing Company.

³See Garrett and Schneck, *op. cit.*, Part I, pp. 93ff.

task of learning associations between certain numbers and letters as rapidly as possible. Letters A to J are numbered in random order from 1 to 10.

A	B	C	D	E	F	G	H	I	J
6	2	8	5	9	10	4	7	3	1

The number of each letter is unknown to the subject. The experimenter calls out A and tells the subject to guess numbers until he names the right number for A. The experimenter says "right," proceeds to B, and so on through the series. The experiment is continued until the subject gets each number right twice in succession through the series. Performance is judged by the total time consumed, the number of errors committed, and the number of repetitions from A to J required.¹

c. *The Conditioned Reflex.*—Psychologists with behavioristic leanings are prone to consider the conditioned reflex as the prototype of all learning. Pavlov's description of the conditioning process is a case of oversimplification, since he fails to take into account the manifold associations which constitute meaning.² Mere sequence or temporal contiguity may explain the flow of saliva, but it cannot adequately describe the factor of "belongingness" without which human learning is ineffective. Furthermore, much of our learning is a conscious effort to achieve a desirable end, whereas the conditioning of a reflex proceeds without much awareness on the part of the animal as to what is going on, and the secretion of saliva is not a particularly satisfying consequence. Some human learning of course is unconscious and, therefore, simply a matter of mechanical association, but the con-

¹J. Peterson: "Experiments in Rational Learning," *Psychological Review*, 1918, 25, 443-467.

²Refer to the discussion of Pavlov's experiments and his interpretations on pp. 26-29.

ditioned reflex is not truly a prototype for conscious learning in which meaning plays a significant role.] A little girl was burned by an infra-red lamp; thereafter, she refused to touch it, whether it was hot or not. On the other hand, her father touches it when it is cold and leaves it alone when it is hot, since he understands the mechanism involved in the situation. There is a world of difference between her learning and his. The learning of the little girl belongs to the category of response which may be specifically designated as a form of unintentional learning; it is learning without understanding.

✓ Learning involves not only the conditioning of the muscles and glands, but also the interrelated activities of hundreds of millions of associative neurons, thus producing responses involving the subtlest relations known by man and the most elusive intellectual adjustments he can make.

The flow of a person's saliva in response to the noon-day whistle is a simple association compared with his association of the Platonic and Aristotelian attempts to solve metaphysical dualism, a realm of thought never invaded by a hungry dog. ✓ Association is the keynote of learning, whether it is called conditioning or not.]

d. Efficient Learning. (1) Learning by Wholes. It is sometimes better in memorizing material to learn by the "whole" method rather than by the "part." Most people will learn a poem line by line instead of concentrating on the poem as a whole. The usual preference for learning by parts is due to the fact that under such a program the individual is encouraged as he sees his progress advancing step by step.] The part method, however, in spite of its popularity, is uneconomical.

Since the poem is to be recited in the forward direction, associations should be established only in that direction. In learning by parts, associations are established between the end of the line and the beginning of the line, as the

learner goes back to impress the line more thoroughly on his mind. Suppose a person is learning:

It is very nice to think
The world is full of meat and drink,
With little children saying grace
In every Christian kind of place.

If each line is learned separately, the problem of mastering the connections between lines still remains to be attacked, whereas, in the "whole" method, the lines are learned in their relationship to the total pattern (forward); consequently, there is no necessity for the double task of mastering both lines and connections separately. Time and energy are saved by achieving both ends simultaneously.

The meaning of the whole must be comprehended if the meaning of each part is to be fully appreciated. ✓The only things which we remember are wholes; and particular things are remembered only as parts of unitary wholes. Memory is a synthesizing activity which combines elements to form wholes. ✓In the light of this fact, it is not surprising that learning is most effective when the "whole" method can be employed.]

The "whole" method is particularly efficient when material is meaningful, and when the learner is an intelligent person. Since attention tends to flag after prolonged concentration, a pause at intervals will keep attention at a high level throughout the performance. The best method, therefore, is to learn a section, pause for a brief rest, and then continue ahead for another section. The learning is consistently forward, with intervals of rest to maintain attention at a maximum.

✓There is no experimental justification for the assertion that the "whole" method is always the most efficient. Whether the "whole" or the "part" method should be employed in the interest of effective learning depends

upon certain conditions,] such as the intelligence and age of the learner, the interest of the material, and the method by which the recall is to be tested.¹

(2) *Repetition*. According to Thorndike's Law of Exercise, other things being equal, exercise strengthens the bond between a situation and a response.² Recent studies, some by Thorndike himself, have indicated, however, that repetition may be effective, but that it is not necessary in the making or breaking of habits. Mere repetition is of little value, particularly if the individual pays slight attention to what is going on.] Progress is facilitated if the individual is aware of his goal and of the trend of his efforts.³ The learner is wise who pays heed to his errors and thereby is enabled to profit by his mistakes. Dunlap's method of negative practice, where the error itself is eliminated by repetition, depends for its success on full cognizance of the folly of the incorrect habit.⁴ Practice is more apt to make perfect where the correct responses are the ones that are repeated.]

Repetition neither strengthens nor weakens an activity, but it does afford other factors an opportunity to exert their favorable or unfavorable influences. Among the important factors determining the value of practice are interest in the performance and the states of satisfaction or annoyance which result from the successes or failures. Associative connections are established fundamentally because there are urges which are responsible for the continuation of practice. Acts are repeated largely be-

¹See G. O. McGeoch: "A Revaluation of the Whole-Part Problem in Learning," *Journal of Educational Research*, 1932, 26, 1-5.

²See E. L. Thorndike: *Education*, pp. 95-97. 1914.

The Law of Exercise involves the principles of *use* and *disuse*: to exercise a modifiable connection between a stimulus and a response strengthens the connection; not to exercise such a connection over a period of time weakens the connection. See E. L. Thorndike: *Educational Psychology, Briefer Course*, pp. 70-71. 1914.

³See E. L. Thorndike: *Human Learning*, p. 19. 1931.

⁴Refer to p. 332.

cause they bring satisfaction.¹ The affective elements involved in the total learning situation are of basic importance. The dynamics of the teacher-child relationship, in which both parties are emotionally involved, may favor or retard the learning process to a significant degree.

Literally speaking, repetition never occurs, for the second appearance of a stimulus is only roughly equivalent to the first; the individual is only approximately the same from one situation to another, and no two responses are exactly alike. Total situations are never repeated.² Situations, individuals, and responses may be alike, but they are always alike with a difference. Repetition, therefore, means that one performance is duplicated only in a general way.

Economy is attained by apportioning repetitions over a period of time. If there is no necessity for rushing, a learning today and another tomorrow will be more effective than two learnings today. ✓ Successive repetitions bring diminishing returns, particularly if they are crowded into a period of continuous work. □ Repeated reviews of a course during a semester will make for longer retention than will repetitions crammed into the night before an examination, although cramming by the "whole" method has its advantages for immediate retention.

(3) *Reward and Punishment.* In the ideal situation a person carries out a program that sweeps him along by the very force of its appeal. Such an interest is said to be intrinsic. A familiar example would be that of the boy who practices catching a baseball because he wants to become a great ball-player. There are, however, many situations where the learner must engage in activities not because he wants to, but because somebody else wants him to do so. Such would be the case with many children who

¹See E. L. Thorndike, *et al.*: *Fundamentals of Learning*, p. 18. 1932.

²See E. R. Guthrie: *The Psychology of Learning*, p. 19. 1935.

take music lessons or study arithmetic. Under such conditions, it is necessary to encourage them to recognize their obligations by supplying rewards for compliance and punishment for failure to fall in line with the demands imposed upon them.¹ Interest, thus, is not in the activity itself, but is supplied from without; in other words, the interest is extrinsic.

✓ It is obvious to the careful student of human affairs that the application of reward and punishment is haphazard and unscientific. On the surface it would seem that rewards would "stamp in" a given pattern of behavior and that punishment would "stamp it out," or as Thorndike phrased it in his Law of Effect, other things being equal, the greater the satisfyingness of the state of affairs which accompanies or follows a given response to a certain situation, the more likely that response is to be made to that situation in the future.²

However, the situation is more complicated than it appears. ✓ The effects of reward and punishment are determined by what they cause the animal or person to do.³ The consequences of punishment are found to be more problematic than the results of reward.] Punishment, to be most effective, must provoke the practice of the correct response, with the immediate award of some sign of approval. Thorndike suggests some definite means

¹See E. B. Hurlock: "The Value of Praise and Reproof as Incentives for Children," *Archives of Psychology*, No. 71. 1924. Also: "An Evaluation of Certain Incentives Used in School Work," *Journal of Educational Psychology*, 1925, 16, 145-159.

In the 1924 study Hurlock found reproof more effective than praise, though the difference was not reliable. Subjective reports indicated they were both effective. Praise and reproof were least effective in the youngest group. Reproof had its greatest effect on "superior" individuals; praise had its least effect on "inferior" individuals.

In the 1925 study Hurlock investigated the same problem with different subjects and concluded that praise was the most effective incentive with all the children participating.

²See E. L. Thorndike: *Education*, pp. 95-97. 1914.

³See Guthrie, *op. cit.*, Chap. 12, "Reward and Punishment."

for improving the effectiveness of punishment, as he feels that "the influence of customary punishments as actually administered has been inferior to that of customary rewards."¹

1. Make sure the punishment belongs to the behavior. If you spank a child see to it that he understands just why the rod is being applied. One aid for clarifying the connection is to inflict the punishment at the time of the transgression.

2. Forestall punishment by satisfying the want innocently. Provide sweets in the diet to prevent the stealing of jam.

3. Shift the emphasis from the wages of sin to the comfort and security of right-doing.

4. Use rewards more.

5. Plan punishment scientifically. The efficient motivation of the learning process depends upon a clear understanding of the incentives to be evoked and the technique for arousing them.

e. Transfer of Training. Before the findings of scientific psychology arose to controvert them, educators delighted in pointing out the wholesale benefits to be derived from pursuing certain subjects in the curriculum, such as mathematics or Latin, on the assumption that whatever training strengthens one "faculty" will indirectly strengthen all the other "faculties." Arithmetic, it was alleged, affords a pupil the opportunity to develop habits of mental attention, argumentative sequence, absolute accuracy, and satisfaction in truth as a result. Such a fond hope has been exploded by the discovery that the effects of educational training, on the contrary, are likely to be specific in nature. "By doubling a boy's reasoning power in arithmetical problems we do not double it for formal grammar or chess or economic history or theories of evolution. . . . The gain of courage in the game

¹E. L. Thorndike, *et al.*: *The Psychology of Wants, Interests, and Attitudes*, p. 151. 1935. By permission of D. Appleton-Century Company, Inc.

of football is never equaled by the gain in moral courage or resistance to intellectual obstacles."¹ ✓ Transfer of training from one sort of mental endeavor to another occurs only under certain conditions. Transfer is facilitated, for example, by the presence of identical elements, either in the material which is studied or in the procedure which is employed.² Training in addition will facilitate multiplication in so far as both tasks involve the computation of numbers, addition itself being a process in multiplication.³ Similarly, ✓ the study of Latin will help the learning of French because many of the words are recognizably similar or identical.⁴ Similarities in procedure will explain why a person who trains himself in chemical experimentation may thereby improve his facility for research in physics.

Woodrow reports an experiment in which the control group and an experimental group were given practice in memorizing the same materials, the experimental group being given special training in the principles and methods to be employed in different kinds of problems. Training in the technique of memorizing included explanations of learning by wholes, the use of active self-testing, the use of rhythm and grouping, attention to meaning, the advantage of picturing or otherwise symbolizing meaning, mental alertness and concentration, confidence in ability to memorize, and the use of secondary associations. ✓ The experiment showed that undirected drill produces amounts of transference which are sometimes positive and sometimes negative, but always small, and that directed drill

¹E. L. Thorndike: *Educational Psychology, Briefer Course*, p. 268. 1914.

²P. Orata: *The Theory of Identical Elements*. 1928.

³See W. C. Trow: *Introduction to Educational Psychology*, Chap. 15, "Transfer and the School Subjects." 1937.

⁴H. R. Douglass and C. Kittelson: "The Transfer of Training in High School Latin to English Grammar, Spelling, and Vocabulary," *Journal of Experimental Education*, 1935, 4, 26-33.

with the same material may result in a transfer, the effects of which are uniformly large and positive.¹]

The specificity of habit was mentioned in connection with Hartshorne, May, and Shuttleworth's study of character organization. In all learning, the spread of improvement from one field to another may be facilitated by definite efforts towards correlation, through the appreciation of common aims and the recognition of interrelationships. The student may carry his scientific attitude from the laboratory to his political behavior, if he becomes cognizant of the applicability of science to politics, but more often than not, his scientific training will not affect his vote because he will fail to see any connection or any need for integration.²

f. *The Age of the Learner.* It is an old adage that "you can't teach an old dog new tricks," but a scientific investigation by Thorndike over a period of two years, under a grant from the Carnegie Foundation, reveals the fact that up to the age of 45 there is practically no subject which the average man or woman of intelligence cannot master if he will.] People along in years demonstrated that they could learn shorthand, mathematics, or languages with astonishing facility. Thorndike pitted his oldest group—those aged from 35 to 57—against young men and women who averaged 18 years old, in learning Esperanto. The former group was composed of candidates for the degree of A. M. at Columbia, while the latter group was made up of students in a good private school. The oldsters made twice as much progress as the youngsters, notwithstanding the youngsters had twice as much class study and (provided they did not shirk)

¹H. Woodrow: "The Effect of Type of Training upon Transference," *Journal of Educational Psychology*, 1927, 18, 159-172.

²See E. L. Thorndike: "Mental Discipline in High School Subjects," *Journal of Educational Psychology*, 1924, 15, 1-22; 83-89.

twice as much home study as the older people. Thorndike also pitted his older people against children from 9 to 11, who were mostly children of exceptionally high intelligence, and, contrary to the old-fashioned notion, the children were the slowest of all in learning the language.

Many a woman of 30 or 40, left without support, has wondered whether she is too old to learn to be a stenographer. Thorndike's investigation demonstrates that the greatest facility for learning shorthand comes between the years of 20 and 24, and that there is only a slight difference in facility at the age of 30.

✓ The traditional belief that childhood is the golden age for learning is untenable in the light of Thorndike's findings. Childhood is not the period in which one learns most readily to read, write, speak, and understand a language, and also the early 'teens are not the next most advantageous period. The gain made by any group of any age from 20 to 40 will be greater than the gain made by a group aged 8, 10, or 12 of equal native capacity.¹

Older persons appear to be poorer learners for several reasons. When they undertake a new subject of study at 35 or 40, they expect to progress just as fast as they did in their 'teens. And of course progress is slow—at first—not because the mentality has declined, but merely because the individuals have interrupted the habit of study for so long a time that they have to build up the habit anew, and sometimes it is a slow process. Often, too, the older people lack the incentive to learn.

Lorge gave learning tests to 143 unemployed adults aged from 20 to 70 years. He found that the apparent decline of mental ability with age differs when different mental tests are used as the measuring stick, those tests involving speed showing the greatest decline. ✓ Age, there-

¹See E. L. Thorndike, Elsie O. Bregman, J. Warren Tilton, and Ella Woodyard: *Adult Learning*. 1928.

fore, involves a loss of speed but not a deterioration in the learning capacity.¹

g. *Applications.* In the light of the data on remembering which we have surveyed, valuable applications to school study may be derived:

1. Train your powers of observation. Traditional education does little to improve perception.
2. Capitalize your special mode of imagery.
3. Develop your several modes of imagery so that you will be equipped to handle all sorts of situations.
4. Discover your optimum speed.
5. Utilize meaning with its numerous associative connections.
6. Realize that mechanical repetition is necessary even where the material is meaningful. Thorough learning involves some painful drudgery.
7. Be convinced that mnemonic devices are uneconomical, since the mind tends to retain only what is absolutely necessary.
8. Decide at the beginning whether you want to learn to remember for a short or a long time.
9. Improve your technique by taking advantage of the "whole method," and by distributing your practice periods wisely.

2. Retention. The learner proceeds upon the hope that what he learns will be retained. Material hastily learned tends to be soon forgotten. Rapid learning, therefore, is efficient where the goal is immediate retention.² A man who is preparing a speech for a single delivery is practicing economy if he learns it just thoroughly enough to remember it for the occasion. If the aim is permanent retention, on the other hand, the material should be over-

¹*Science News Letter*, January 11, 1936.

²E. Meumann: *The Psychology of Learning*, p. 171. 1931.

learned, that is, should be repeatedly studied even after it can be completely remembered.¹

Meltzer conducted an experiment to test the effects of pleasantness and unpleasantness on retention. One hundred and thirty-two college students were instructed just after their return to school to list and describe all of their experiences during the Christmas vacation. Pleasant experiences were marked P, unpleasant ones U. Six weeks later, with no warning, the subjects were asked again to recall their vacation experiences. More of the pleasant experiences were retained, though individuals differed in this respect. There was a marked average difference in favor of the pleasant after only a short interval of time.²

Immediate retention depends more upon the impression; permanent retention more upon the development of associations.

Forgetting is most rapid soon after learning. The curve of forgetting will, of course, depend upon the specific conditions present, such as the nature of the activity, the previous practice of component activities, and what is done in the intervals between practices. Nonsense material is forgotten more rapidly than meaningful material.

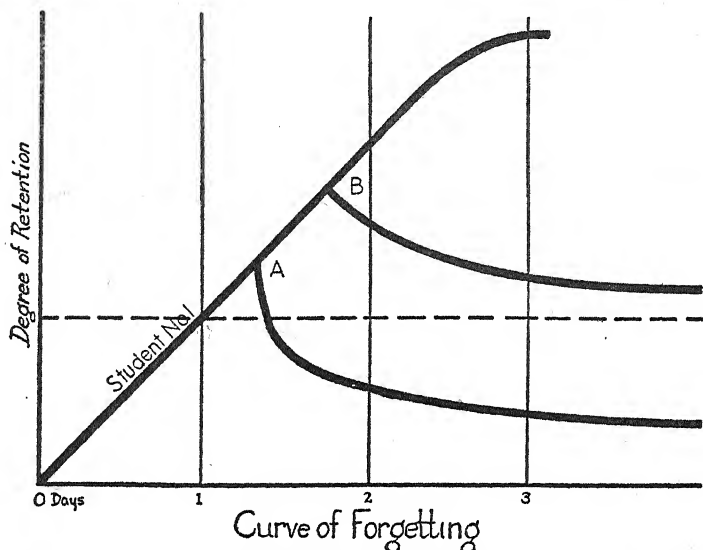
Some events may be forgotten because they were unpleasant, some because they made only a faint impression, and some because they are involved in conflicting associations.

Associative inhibition, at times, interferes seriously with recall. Suppose you learn to associate r-a-l: m-e-s and then you are instructed to learn to associate r-a-l: b-a-p. You will find that the first association obstructs the for-

¹Retention and recall are closely related. If an experience can be recalled, it has been retained; but some experiences are retained even though they cannot be recalled.

²H. Meltzer: "Individual Differences in Forgetting Pleasant and Unpleasant Experiences," *Journal of Educational Psychology*, 1930, 21, 399-409.

mation of the second. When the common first member of each pair is shown, inhibition results as the two syllables, m-e-s and b-a-p, get in each other's way, so to speak. In every-day experience, recall is rendered momentarily



THE RELATION BETWEEN THE LEARNING CURVE AND THE CURVE OF FORGETTING

From point A in the learning curve, forgetting soon carries the material below the limen of recall. From point B, however, the loss of retention is not great enough to prevent recall after a lapse of several days. The loss is initially great; but the rate of forgetting subsequently progresses at a slower and slower rate.

inefficient because the individual sets off on the wrong track in search of a word or a name. A person, for example, in trying to recall a man's name, was sure that it began with "H." He could not make any progress. Finally he allowed the matter to drop, the "H" association no longer blocked the path, and the name "Sawyer" flashed into his mind. Learning a thing wrong stands in the way of learning it right. When a later learning

activity interferes with an earlier learned activity, the interference is known as retroactive inhibition.¹

Forgetting is not a matter of passive decay. In most situations there is an active blocking of the old by the new, a process just defined as retroactive inhibition.² For example, a student may have to prepare the night before for two examinations on the following day, say history and psychology. He may learn his history and then go on to psychology. The next day he may find that the preparation for psychology interferes with the recall of the history material.

There are many persons who think they have forgotten something merely because they are unable to recall it. "I cannot remember the name. Let me see. Smith? No. Jones? No. Well, I give up."

"Was it Adams?"

"Yes, that's it."

The name was gone but not forgotten. Recognition often functions where recall fails. The ability to recognize the forgotten element is evidence that forgetting is not complete.

3. *Recall.* Recall is the revival of a past experience, effected when one member of an association enables the mind to trace the other member through a definite connecting link of a meaningful nature. Remembering is not a simple reduplication of a pattern, but a constructive imagining through which past experience is transfigured to meet the present need. Memory transforms ideas. New events bring about constant changes in our judgment of past events.

An idea is not a simple revival of a definitely perceived

¹See C. R. Griffith: *An Introduction to Educational Psychology*, pp. 439-444. 1935.

²See J. A. McGeoch: "Forgetting and the Law of Disuse," *Psychological Review*, 1932, 39, 352-370.

thing, but the product of many perceptions and of their subjective elaboration by the perceiver. It is difficult to draw the line between what is remembered and what is contributed by imagination and judgment, because these parts blend together to form a unitary whole in consciousness. Falsifications of memory are often due to such fusions of habitual associations.

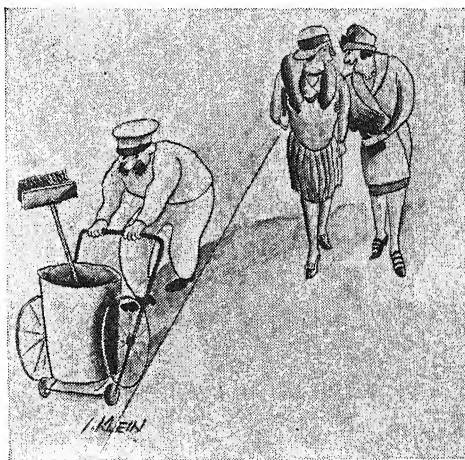
Our thoughts are connected by characteristic links which have been classified under laws of association. Ideas are sometimes related by *similarity*. "That reminds me of a story" gives the after-dinner speaker an excuse to introduce a story, though the possible connection is often hardly appreciable.

Sometimes ideas are related by *contrast*. The fat man in the circus may remind the observer of a thin friend.

Sometimes ideas are related by *contiguity*, either of space or time. "Where

have I seen you before?" is a search for spatial contiguity. When you are at a loss for the name of a person you have met before, you may revive it by recalling the time you were introduced to him, through temporal contiguity.

A study of logical relationships, such as those involved in the Laws of Association, does not explain adequately all



ASSOCIATION BY SIMILARITY

"I just thought to tell you of it, my dear. Today I bought the loveliest tea wagon."

(By permission of the *New Yorker* and I. Klein.)

cases of association, since affective factors also play a significant role in recall.

Did you ever try to trace your thinking backward to ascertain how you came to a certain idea, or to unearth something that has momentarily slipped your mind? Following a train of thought by means of the connections in either the backward or forward direction is an excellent method for studying the laws of association. A neighbor from back in the old home town dropped into the office of the city columnist and sat down at the end of the desk.

I thought I'd come in and see you, but you don't know me from Adam.

I used to see you when you played baseball in Harrisonville and worked on the *Democrat*. The *Democrat* had a piece about you a while back and that's the way I knew where you were. You're changed some, but not as much as my cousin, John Mellor. I guess you didn't know John. He married one of the Harkness girls. Old man Harkness is dead. He died in '85 or '86. It must have been '86. It was the year Abe King bought the Sample place. Abe couldn't read or write. Ed Spinney saw one of his boys in Florida last winter. It's surprising the way people scatter out. John Trotwood Moore was in Harrisonville not long ago. He married the oldest Daniel girl; I forget her name, I don't suppose you remember it either. I always say I can remember faces but I forget names. I saw Sam Mahaffey in St. Joe in 1896. He came up to me and said, "I guess you don't remember me." I went up to St. Joe to buy a carload of feeders. I never saw a better prospect for corn than there was that year, but we didn't get nothing but nubbins. It seems to me the winters are growing harder. Either that or I notice the cold more.

Women are funny. You wouldn't think to look at me that I'd been married four times. Press Stoneking said to me one day last week, "Newt, you don't look your age by twenty years." I met him in the road below Corriden's pasture. He was driving a new "Lizzie." Well, I've worn out four cars, and I say they're an extravagance. Reck Simlick has run through with everything he had. Women and liquor mostly, and dancing. We had a big row last fall about whether there should be dancing in the

school auditorium. We stopped it. I was on the Election Board one year. We didn't get the vote counted till after nine o'clock. John Rothrock was there when I drove in. John went to California. He had a felon on his thumb; he suffered terribly. I had one when my second wife was taken. Her name was Abigail; she was one of the Simpsons that lived down by Buckhorn. You wouldn't know Buckhorn now. You say you never did know it. Well, that's too bad. It's funny. I had an idea you had traveled a good deal.¹

The likelihood of recall depends, in part, upon four factors: vividness, primacy, frequency, and recency. An event which makes a vivid or deep impression is apt to be remembered. First impressions are inclined to be lasting (primacy). Repetition, with qualifications already noted, may facilitate recall (frequency). Recent events are likely to be recalled easily. In terms of conditioning, the influence of recency may be formulated thus: "When two different responses have been attached to the same substitute stimulus or cue, the one attached last has the advantage over the other."² The mere lapse of time, however, may not weaken the effects of learning. Weakening occurs when, during the lapse of time, new learning erases the old. Van Ormer found that less is forgotten during sleep than during waking periods, because in sleep there is no obliteration of the old by the new.³ Guthrie suggests that grief may subside, not because "time is the great healer," but because other activities become so absorbing that they inhibit the memory of bereavement.

Associations may be studied by Free Association Tests. Such tests may involve *continuous* association where the subject is to think of all the words he can in a certain period of time, say three minutes, or *discrete* association

¹Jay E. House: "On Second Thoughts," in the New York *Evening Post*. By permission of Mr. Jay E. House and the New York *Evening Post*.

²Guthrie, *op. cit.*, pp. 114-115.

³E. B. Van Ormer: "Retention after Intervals of Sleep and Waking," *Archives of Psychology*, 1932, No. 137, p. 49.

where the subject is instructed to respond with the first word coming to his mind in connection with each of a list of words read one at a time by the experimenter.

Examples of Free Association Tests of the discrete type are the test developed by Jung and the test evolved by Kent and Rosanoff.

A valuable study of the associations underlying recall in particular, and thinking in general, is to be found in Jung's Association Tests for the detection of complexes. A list of words is constructed, with the significant words scattered among the words unrelated to the person's complexes. The words are read to the observer one at a time and he is instructed to answer as quickly as possible with the first word that occurs to his mind.¹ Words are situations to which the observer reacts and the nature of his response reveals the emotional tones connected with the situation. If a person has used cyanide to dispose of his neighbor's dog, the word "poison" is apt to evoke immediately the word "cyanide." Such a response would be "a dead give-away." Realizing this fact, the observer casts about in his mind for an innocent word and responds with "rat." In this case, the longer reaction time, among other factors, is tell-tale evidence of his guilt.²

The origin of an attitude may be discovered by such an association test. A person may have an aversion for watermelon and be unable to explain his disliking for that particular delicacy. "Watermelon" may evoke "Jones," the name of a farmer whom he knew in his childhood, and the connection may lead to the recall of the punishment meted out to him by his father for stealing one of Jones' watermelons. Thus the source of his "watermelon complex" is unearthed.

¹See Carl Jung: *Collected Papers on Analytical Psychology*, Chap. 2, "The Association Method." 1916.

²Refer to pp. 267-271 for a description of Luria's technique for investigating mental conflict by means of Free Association Tests.

Kent and Rosanoff have developed an association test that reveals common reactions and individual reactions which may shed considerable light, taken as a whole, upon the normality of the subject's personality. Frequency tables have been worked out for one thousand subjects. In response to "table," two hundred and sixty-seven said "chair," four "dining," and two "mahogany." In response to "chair," one hundred and ninety-one said "table," one hundred and seven "seat," one hundred and seven "sit," and one "upholstered." Individual (personal) reactions may indicate abnormal personality trends, whereas common reactions may be evidence of tendencies toward a normally adjusted character.¹

Associations may be studied also by Controlled Association Tests which measure largely the speed and facility with which certain familiar associations can be reinstated. The subject's response is so restricted by the instructions that only one reply is possible. In an opposites test, for example, there is only one reply to the word "night." Some of the more complicated tests involve the comprehension of relations, and appear, therefore, as a part of intelligence tests.

One of the best Controlled Association Tests is that worked out by Woodworth and Wells, a sample of which follows:²

Opposites Test

high—
summer—
out—
white—
slow—
yes—
above—
north—

Part-whole test

elbow—
hinge—
page—
finger—
wing—
morning—
blade—
mattress—

¹See A. J. Rosanoff: *Free Association Test*. Sixth edition, 1927.

²See R. S. Woodworth and F. L. Wells: "Association Tests," *Psychological Monographs*, 1911, 13, 57. By special permission of F. L. Wells.

Mixed Relations Test

Eye—see	Ear—
Monday—Tuesday	April—
Do—did	See—
Bird—sings	Dog—
Hour—minute	Minute—
Straw—hat	Leather—
Cloud—rain	Sun—
Hammer—tool	Dictionary— ¹

Faulty associations account for the errors popularly known as “boners.”² Frances Willard was identified as a well-known colored prize fighter, due to a confusion of Frances Willard, Jess Willard, and Jack Johnson, the last a negro pugilist knocked out by Jess Willard in a famous battle some years ago. Similar explanations will reveal the occasions for the following mistakes:

Marconi: a popular Italian dish.

Jane Addams: author of “Pride and Prejudice.”

LaFollette: French ambassador to the United States who helped the American Revolution.

Shaw: a former life prisoner now freed.

Barrie: a child movie actor.

Curie: proposer of a peculiar belief—“if you think you are, you are.”

Fiume: a delightful peak of nature in the White Mountains.

George A. Gordon: manufacturer of Gordon’s fish cakes.

Obregon: an actor in the “Passion Play.”

Homer: a type of pigeon,

Conan Doyle: a famous detective in employ of English stock-yard.

Polonius: a mythical sausage.

Ali Baba: being away when the crime was committed.

Esau: a man who wrote fables.

Senator: half horse, half man.

¹For another useful Controlled Association Test, see Means’ “(Hard) Opposites Test.” Consult *Psychological Monographs*, No. 1, 1921.

²See Lowell A. Norris: “Master Mistake Meets Dr. Psychology: A Review of Dr. W. F. Vaughan’s Research into Sources of Student ‘Howlers!’” *Psychology Magazine*, September, 1929.

The Association School of Psychologists, represented by Locke and his successors, based their system upon the association of ideas.¹ Ideas were compounded and combined and associated according to the laws of association. Psychology was a mental chemistry.

Modern psychology emphasizes the bonds established, not between ideas, but between impulses or responses and the stimuli by which they are evoked. The conditioned response is a case of association. In many conditioned responses, of course, no ideas are involved. The individual is often unaware of the manner in which he acquires new reactions. Memory in such cases is physiological rather than psychological. Advertising succeeds by insidiously planting associations in the unsuspecting observer. A toothpaste advertisement shows a beautiful lady in "one of the most expensive hostess gowns in the world—obviously not for the masses." Unwittingly the reader comes, through association, to feel in a vague way that the brand is something exclusive, and that using it is a mark of cultured refinement. Thus a response is built in by a conditioning process which is all the more effective because it is so subtle.

The reproduction of a particular idea in a particular case is due not only to previously acquired associations, but is also due quite as much to factors involved in the present state of consciousness—the determining tendencies in operation at the moment. For example, you may think of a letter which came in the mail because the unpleasant mood engendered by the initial reading of it still persists, predisposing your mind to revive the letter continually as long as the mood lasts. The importance of the present situation in recall is evidenced by the fact that spontaneous testimony is usually very inadequate. Many additional

¹See H. C. Warren: *A History of the Association Psychology*. 1921.
See also E. S. Robinson: *Association Theory Today*. 1932.

memories may be revived by a skillful cross-examination which provides the mind with a variety of effective sets.

Recall depends, too, upon the intentions uppermost in the mind of the learner during the time when the material was being acquired, since a specific intention in the act of learning has a specific effect upon the result. The likelihood of recall is determined, in part, by the adaptation of method of learning to the purpose of the total procedure, according to whether there is plenty of time or just an instant for observing the stimulus, and according to whether immediate or permanent retention is the goal to be achieved.

Two common experimental methods for studying recall are the Method of Retained Members and the Method of Paired Associates.

In the Method of Retained Members, more items are presented than the subject can possibly recall. The score is computed by the number of items successfully reproduced. Presentation is usually either visual or auditory.

In the Method of Paired Associates, a pair of items is presented, either visually or orally. When the series of pairs is completed, one member of each pair is given and the other is to be supplied by the subject. The order is shifted in the test series to prevent the learning of associates in serial order. Have someone read the series so that the following pairs will be presented one at a time.

pen—tree	type—hill
skate—desk	box—roof
book—light	dog—early
auto—grass	smoke—sharp
day—church	try—laugh
dirt—note	read—square

Now have the reader give you the first word of each pair, allowing you five seconds for naming the associate. Try

the same experiment, making up a list of nonsense syllables.

4. Recognition. Recognition, as previously stated, is easier than recall. "Pocahontas rescued John Smith—true or false?" is an easier problem to solve than completing the statement, "Pocahontas rescued —."

The capacity to recognize is usually sufficient for practical purposes, since the individual is thereby enabled to adjust himself to a situation in the light of his particular past experience. There is no wisdom in overburdening the mind with unnecessary luggage.

Recognition is characterized by the experience of "againness," a feeling of familiarity. The subjective feeling of certainty is no guarantee of the validity of recognition, as is illustrated in the familiar *déjà vu* illusion, where a person feels he has seen a thing before somewhere, though he has not actually done so. Recognition is the psychic indicator of the accuracy of recall. Recognition functions as a check upon recall, in that the item recalled is referred to time and place for a judgment based on the feeling of familiarity.

Recognition may be implicit, in which case the object arouses the experience of "againness," though the individual is unable to place it. Thus you may know that you have seen a person before, and yet not be able to recall just when or where you saw him. Recognition may be explicit, in which case the orientation of the object with respect to the past is carried out successfully. When implicit recognition becomes explicit, the baffled feeling gives way to one of relief.

In a typical experimental test of recognition, twenty-five items, such as words, pictures, or designs, are exposed by the tachistoscope to the observer. These twenty-five items are then mixed with twenty-five more, and the whole series of fifty items is submitted. The subject is told to

indicate the items he has seen before. Errors consist of failure to recognize an item seen before, and false recognition of items not previously presented. The score is usually computed by deducting twice the number of errors from the total number shown, thus penalizing the effects of guessing.¹

If the observer relies on guessing throughout the test, he has a 50-50 chance of getting half of the items correct, that is, of picking 25 of the 50 correctly by mere coincidence. The deduction is made in the scoring in order to penalize the guesser.

III. ANTICIPATING

Imagining directed toward the past we have designated as remembering; imagining pointing to the future we shall call anticipating. Pre-cognition differs from re-cognition in respect to its time-reference; the former being forward in its reference, the latter backward. It is important to keep this distinction in mind because the term "imagination" as used by the layman usually includes in its connotation only the forward reference. "Anticipating" is a more accurate term than "imagination" for describing the mental activity which is aiming at the prospective solution of a problem-situation. The financier, like the author, must build up his plot, imagining what other folks will do at certain moments and planning his own program in accordance with his predictions. Business requires no less imagination than writing fiction.

A. Thinking. Thinking consists essentially in remembering the past in an effort to utilize that experience in anticipating the future. Thinking is a delayed reaction, an inner rehearsal, which spares the individual the penalty of costly errors, by providing a plan for the economical

¹See Garrett and Schneck, *op. cit.*, Part I, pp. 126ff.

guidance of performance when the ideas eventuate in action. The fundamental function of the mind is to act as an intermediary by which the wants of the organism may become satisfied. Its basic function is the anticipation of experience. Random ideas are checked long enough to be lived through mentally before they are expressed in overt adjustment. Adjustment is intelligent when anticipation of an act precedes its execution.

B. Foresight. Anticipation means foresight. The expert in any line of endeavor must anticipate the impending moves of those persons with whom he has to deal. The man who is eager for a raise in pay, for example, must regulate his office behavior with reference to the prospective reactions which he will probably evoke in his employer, and take care to select the psychological moment for presenting his petition in order to gain a favorable response. He must anticipate the employer's objections to his request, prepare his answers to those objections, and plan his objections to the employer's objections, so that the ultimate issue of the argument will be the raise desired.

Prediction and control, it was stated earlier, are the aims of science. Exact knowledge is desirable because it makes possible accurate anticipation. To see ahead is to facilitate the effective adjustments which depend upon planning for their successful execution.

The ability to anticipate the consequences of action is a suggestive index of a man's intelligence and character. Bringing the past to bear upon the present situation, a person suspends his impulses until he has had time to deliberate upon alternative courses of action. "Thinking it over" consists largely of a survey of the contingent results in the light of cause-effect relationships reviewed from the past. The capacity for thinking through an event to its consequences can be investigated by a Free Response Foresight Test, in which the subject is instructed

to think of all the things that might happen in connection with such incidents as the following:

1. Whenever anyone picked on John, he would go tell his teacher.
2. John accidentally broke a street lamp with a snowball.
3. Jim was anxious to make good marks at school; so he usually studied instead of going out to play with the other fellows.¹

Varying the procedure and the presentation of material, the subjects are given the opportunity to select the most probable and the most important consequences, and the reverse, and to decide what they would do if they were confronted with such situations. These various procedures were planned on the assumption that foresight implies:

1. The ability in any situation to think of a large number of consequences.
2. The ability to judge between consequences as to their probability.
3. The ability to judge between consequences as to their importance.
4. The ability to decide the best course of action to pursue on consideration of all the consequences likely to follow.²

Vernon Jones has worked out a similar procedure to secure evidence for Character Education. A true story from the lives of great men and women, such as the following, is recounted. Samuel Gompers, as a boy, was a close companion of a relative of his, a boy named Simon, who was ten months older but physically weaker. Samuel protected Simon from bullies, but he was unwilling to have Simon impose on him. The two boys were supposed to get the milk at a near-by dairy every day. Samuel

¹H. Hartshorne, M. A. May, and F. K. Shuttlesworth: *Studies in the Organization of Character*, pp. 43-44. 1930. Credit for the work is also due to Angus B. McLean and George S. Patterson.

²*Ibid.*, p. 240.

thought they should take turns in carrying it, but Simon often refused to coöperate. One day Simon rebelled when Samuel insisted that it was his turn. Samuel felt it was time to give Simon a lesson in fair play. They both left the milk in the road and continued homeward, each demanding that the other go back for it. The folks at home sent them after the pail. The milk was not to be found, for some animal had drunk it, and the pail was battered out of shape. "It's your fault," said Simon. "It's your fault," said Samuel. They were both whipped when they returned home. Later in the day they met, their eyes red from crying. "You made me get a whipping," said Simon. "You made us both get one," said Samuel. "Next time you will take your turn, I guess." "Not unless you do," said Simon.¹ What would you have done? "An attempt was made," says the author, "to stimulate the child to see relationships in the realm of choice, to stimulate him to see consequences of certain decisions, and to encourage him through thought questions to generalize. . . . The experimenter and the class set out to discuss any problems of choice suggested by the episode, and not to draw up a set of rules of conduct as a result of each discussion."²

The infantile mode of procedure is to act impulsively, and then to consider after the deed is done. The suspension of action for the purpose of anticipative deliberation is the mark of maturity. "We must learn to look forward to the consequences of pursuing a desire, not inward to its emotional appeal or backward to its traditional sanctity."³ The role of anticipation will be considered further in

¹See Vernon Jones: *What Would You Have Done?* Pp. 3-6. 1931.

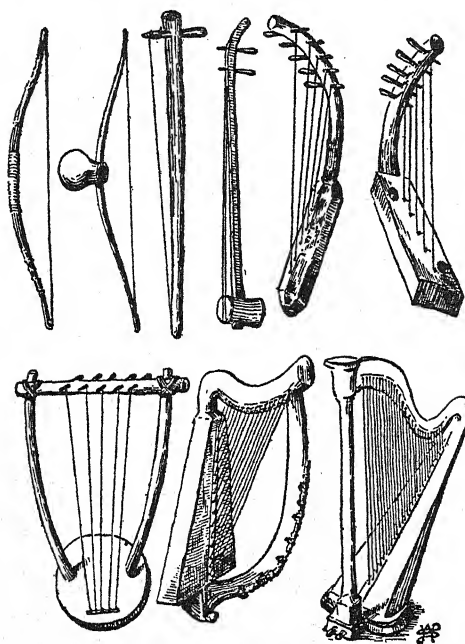
²Vernon Jones: *Character Education through Cases from Biography*, p. 28, a Teachers' Manual to Accompany *What Would You Have Done?*

Also E. F. Hague, M. Chalmers, and M. A. Kelley: *Character Story Readers*. University Publishing Co., Lincoln, Nebraska. 1931.

³Hugh Hartshorne: *Character in Human Relations*, p. 266. 1932.

Chapters 11 and 12, when its importance for thinking and intelligent behavior will be more adequately indicated.

C. Constructive (Creative) Imagination. Constructive or productive imagination, in distinction to reproductive imagination, proceeds by recombining past experiences in new ways, modifying the elements, if necessary, to fit



How the Bow Became a Harp¹

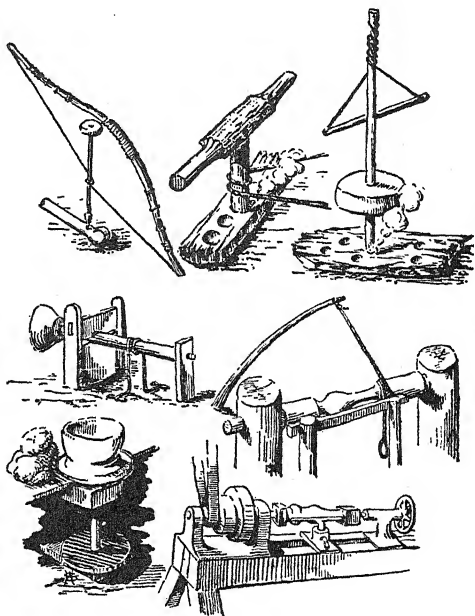
the new pattern. Most inventions are the culmination of a gradual evolution. Stringed musical instruments and belt-driven rotative machinery are traceable, step-by-step, from the primordial bow and arrow. Some creative thinker bridged the gap between the hand-thrown javelin and the bow and arrow. The twang

of the bow produced a musical note, suggesting the conception of string music. The addition of a resonator, the multiplication of strings, and the improvement of the bow were natural steps in the evolution to the harp, and, by the creation of an enlarged sound-box, to the piano. Similarly, some

¹This cut and the one following are reproduced from William H. Smyth: "What Is Invention?" *The Journal of the Patent Office Society*, reviewed in *The Literary Digest*, January 10, 1931.

inventive genius discovered that, as a means for drilling holes, his bow and arrow could be substituted for the tiresome method of twirling the drill between the palms of his hands. It must occasionally have happened while drilling in wood with the bow and a drill, the point of which had become blunted and rounded by use, that the resulting dry wood-dust burst into flame from the heat generated by the rapid rotation of the blunt drill.

Thus was suggested the use of the bow and a pointless arrow as a fire making instrument—the fire-drill. Later, we may surmise, the four-handed fire-drill was invented; still later, the elegant apparatus in which both the needed pressure and the twirling functions were combined in the down-stroke of a cross-bar. From the fire-drill to the lathe is a comparatively short step, merely involving a shift of position from vertical to horizontal, and from a portable to a stationary device. The potter's wheel is only the primitive lathe put back into the vertical position with the addition of a flywheel. The rotation of the potter's wheel is effected by the foot of the operator, thus leaving his hands free for shaping



How the Bow Entered Industry

the clay. Modern rotative machinery is simply a further stage in the evolution.

Whether anything can be imagined of which any part has never been perceived in the past, is an open question. The term "creative imagination" seems to imply that something distinctly new has been evolved by the functioning mind.¹ The credulous person, in particular, likes to believe in mysterious inspirations which have produced something out of nothing. A careful study of creative productions reveals some interesting facts which suggest that a natural explanation may, indeed, be adequate.

Poetic genius is famous for its flashes of insight. Longfellow made this entry in his Diary:

I wrote last evening a notice of Allston's poems. After which I sat till twelve o'clock by my fire, smoking, when suddenly it came into my mind to write the "Ballad of the Schooner Hesperus," which I accordingly did. Then I went to bed, but could not sleep. New thoughts were running in my mind, and I got up to add them to the ballad. I feel pleased with the ballad. It hardly cost me any effort. It did not come into my mind by lines, but by stanzas.

The spontaneity of such a creation fosters the illusion that the poem "came right out of a clear sky," or more specifically, right out of nowhere.

But as evidence that such spontaneity is an illusion, it is worthy of note that the poet gets a poetic inspiration, and not a brilliant hunch for improving the weight-balance of bridges or for baking better biscuits. This fact that inspirations are confined to a special field of interest suggests that intuition depends, far more than is obviously apparent, upon accumulated effort. Inspiration is the fruition of labor. The misleading factor is that the insight comes at unexpected moments when the material pondered

¹See J. M. Fletcher: *Psychology in Education: With Emphasis on Creative Thinking*. 1934.

over has lapsed into the subconscious regions of the mind, so that the source, being forgotten, may elude detection.

The creative process evolves through several successive stages:

(1) Preparation—first is the period in which the problem is investigated.

(2) Incubation—next, the mind goes over the information acquired in the first stage.

(3) Illumination—then, of a sudden, appears the inspiration, the hatching after the incubation.

(4) Verification—finally, the solution is checked for its validity and revised to fit the facts accurately.¹

The dependence of creative imagination upon forgotten past experiences has been beautifully revealed by Lowes' investigation of the long process of preparation and incubation which culminated in the inspired writing by Coleridge of *The Rime of the Ancient Mariner* and *Kubla Khan*. Coleridge left a notebook through which Lowes traced his readings and related them to his poetic creations. "I have read almost everything," wrote Coleridge. The notebook is a hodgepodge of information, showing that the poet had been "reading with a falcon's eye for details in which lurked the spark of poetry."² "To follow Coleridge through his reading is to retrace the obliterated vestiges of creation."³ Thus as his mind became steeped with travel lore, a reservoir was established as a source of his poetry. Let us take some samples.

There is a Tradition among them, that in November, 1668, a *Star appear'd below the Body of the Moon within the Horns of it.* (From Volume V of a work, *Philosophical Transactions.*)

Reading

¹See G. Wallas: *The Art of Thought*, Chap. 4, "Stages of Control." 1926.

²John L. Lowes: *The Road to Xanadu: A Study in the Ways of the Imagination*, p. 33. 1927. By permission of and by arrangement with Houghton Mifflin Company.

³*Ibid.*, p. 37.

Poetry

Till clomb above the eastern bar
The horned moon, with one bright star
Within the nether tip.

Reading

During a calm . . . some parts of the sea seemed covered with a kind of slime; and some small sea animals were swimming about . . . that had a white, shining appearance. . . . When they began to swim about, which they did, with equal ease, upon their back, sides, or belly, they emitted the brightest colours of the most precious gems. . . . Sometimes they assumed various tints of blue. . . . But . . . the colour was, chiefly, a beautiful, pale green, tinged with a burnished gloss; and, in the dark, it had a faint appearance of glowing fire. They proved to be . . . probably, an animal which has a share in producing . . . that lucid appearance, often observed near ships at sea, in the night. (From Cook's Voyage to the Pacific Ocean.)

Poetry

The very deep did rot: O Christ!
That ever this should be!
Yea, slimy things did crawl with legs
Upon the slimy sea.

About, about, in reel and rout
The death-fires danced at night;
The water, like a witch's oils,
Burnt green, and blue, and white.

Inspiration proceeds by the same paths in scientific hunches. A hunch is a unifying or clarifying idea which springs into consciousness suddenly as a solution to a problem in which we are intensely interested. It follows a long period of study, but comes into consciousness at a time when the mind is not consciously working on the problem. A hunch frequently springs from a wide

knowledge of facts and may be attributed in many instances to insight.

Archimedes was taking a bath. All at once he had a bright idea—a sudden flash of intuition. Without stopping to pick up his clothes, he leaped up and ran through the streets of Syracuse, shouting, "Eureka! I have found it!" He had discovered the law of floating bodies.

One scientist was studying the problem of how to improve circulation of oil in pipe coils. The correct principle came to him like a flash, in church, when the preacher was announcing the text of his sermon. Another scientist reports that most of his hunches come to him in the early morning while in bed thinking about some problem on which he has done considerable work. He states that he does more work before getting up in the morning than after. Still another scientist finds that most of his problems are solved at night while he is trying to go to sleep. The experience is so common that he keeps a pad and pencil on a table near his bed, to jot down ideas.¹

Hunches often come in the period between wakefulness and sleep because the drowsiness of the mind removes the interfering obstructions which operate in the waking hours when thought persists in starting off on wrong tracks. This period is known as the hypnagogic state.

Inspiration is not a miracle but a natural phenomenon subject to scientific explanation. Striking revelations take place only after a period of work; they complete or continue something already begun. When the solution is complex, it does not come to the mind with all the details fully worked out; the key is at hand, but it has still to be used. These revelations are rare. Discoveries just as remarkable are made much more frequently in the ordinary way—that is, in answer, it seems, to continuous effort. If it is true that the solution of a problem may

¹From a report by R. A. Baker to the American Chemical Society.

come unexpectedly and, at times, long after we have ceased to be actively engaged in its consideration, nevertheless, there is no satisfactory evidence in support of the assumption commonly made that it ever appears after the person has ceased to be interested in it. On the contrary, the solutions that come in the form of inspiration refer to problems which have not been finally dismissed, which have remained, as it were, in the "back of the mind," ready to force themselves upon the attention. Instances of inspiration do not seem to transcend the apparent capacity of the persons who get them.¹

Certain types of thinking do not proceed steadily and consistently to their goal, but by leaps and bounds. Inspiration is simply the fruition of purposive thinking which has faltered under the weight of a difficult problem, only to rest for a moment to regain its strength, and then to continue on its way to a solution.

SUMMARY

Imagining enables us to deal with objects not present by representing them in images or symbols which can be mentally manipulated. People differ widely in the particular forms of imagery they employ, the concrete and the verbal being the two fundamental kinds. Symbols may be studied to great advantage in dreams during sleep, and in daydreams.

When imagining refers to the past, it is called *remembering*, an activity involving learning, retention, recall, and recognition. The will to learn, care in observation, and tying up data with personal experience all affect the efficiency of remembering.

Imagining with a future reference is called *anticipating*.

¹See J. M. Fletcher: *Psychology in Education*, Chap. 11, "Differentiating Characteristics of Creative Thinking." 1934.

The main function of thinking is thus fulfilled, as the past is used to predict the future, so that action may be planned ahead of time. Creative imagination is the culmination of a process in which preparation and incubation precede the stages of illumination and verification.

creative imagination
preparation
incubation
illumination
verification

THINKING

MANY OF OUR ADJUSTMENTS are made without full realization on our part of all the factors determining action. Thinking, however, is the process through which we seek consciously to organize experience. To "think of" is to be aware of an object; to "think about" is to relate that object significantly to other objects, to pass from apprehension to comprehension. Thinking proceeds by referring the past to the future, as we remember in order to anticipate.

I. THE FUNCTION OF THINKING

Putting two and two together, developing the implications of a situation, drawing conclusions, are apt phrases to describe the nature of thought. "To think is to bridge a gap in experience, to bind together facts or deeds otherwise isolated."¹ Experience is organizable because the mind is ever ready to recognize connections and to get understanding.

The invention of the spring bed shows how thinking involves the appreciation of relationships. About ten years before the Civil War, Mr. James Liddy of Watertown, New York, sat in his buggy waiting for his wife who had gone shopping. Struck with the superior comfort of the spring upholstered cushions, he roused himself enough

¹John Dewey: *How We Think*, p. 80. 1910.

from his drowsiness to get an idea. Why not use buggy springs in place of ropes to make beds comfortable? In a spring wagon factory at Watertown he gathered an assortment of old buggy springs and installed them in four-poster beds to take the place of the old, annoying and sagging ropes. That was the first spring bed, a typical Yankee invention which abolished the discomforts of sleeping which man had suffered for some twenty thousand years.¹

When we cogitate, we deal with relations in such a way as to gain an appreciation of meanings. One item in experience signifies another, points to it through some definite relationship, as exemplified in the interpretation of signs. On the Atlantic coast "a salty smell" in the air means "east wind" and "east wind" signifies "rain." Conditioning occurs as the associations are repeated until the time arrives when the mind passes automatically from premise (east wind) to conclusion (rain).

It is difficult to ascertain how much intellectual understanding may be involved in the conditioning process. Associative bonds are involved in the conditioning process and in the logical process; in the latter, the associative links must be consciously appreciated, while in the former they may or may not be outside awareness. When the advertiser pictures his low-priced car in front of a palatial residence, we may say that the reader is encouraged to make the inference that the ownership of that particular make of car is a sign of good breeding, or we may say that he is conditioned in such a way as to react in the same deferential manner to that car as he does to persons with prestige. Fortunately for the advertiser and the manufacturer, the inference, if such a process be involved, is drawn unconsciously, since even the briefest logical analy-

¹D. A. Laird: "The Heredity of the Modern Bed," *The Scientific Monthly*, November, 1935.

sis of the situation reveals its absurdity. It is difficult to say just how much logic enters into human behavior. The relationships are there, in our experience, but they often proceed unanalyzed to affect our actions for better or worse. Logic can seriously affect the conditioning process if it will. The reader who pauses to pierce the illogic of the advertisement upsets the conditioning so subtly plotted by the advertiser. The advertiser, indeed, usually thinks for the consumer; it is a wise consumer who thinks for himself. Certain it is that a conscious examination of associative connections in our experience will promote comprehension. Intelligent action is, after all, the goal of thinking.

Necessity, so the proverb goes, is the mother of invention. Thinking is a last resort, forced upon us by a pressing problem. A feeling of perplexity resulting from the thwarting of some desire impels us to search for some solution. Thought begins with a question that requires an answer. The course of conduct, being blocked, variation is necessitated; alternatives are weighed. For example, the depression which disorganized business in 1929 compelled industry to search for new ways to profit. While many gave in to discouragement, the resourceful looked around for novel methods to defeat the slump.

In the midst of the new, the precarious, the uncertain, and the obscure, the individual must pass from the known to the unknown in the process of discovery. Something present suggests something further until the mind is led on to the solution of the puzzle confronting it. Thinking is problem solving. There is an end to be attained, there are means to be used, there is a procedure to be organized.

Consciousness has a prospective function which is fulfilled by planning adjustment in the light of past experience. Thus the desire to control natural forces to promote our own ends is more efficiently satisfied. "Biologically

the purpose of ideation is to prepare for action."¹ "Consciousness is the life impulse in the process of becoming conduct."²

The immediate expression of an impulse is fatal to thinking. To yield to caprice is to be guided by the circumstances of the moment. Thought involves the inhibition of action, the suspension of judgment. Effective thinking depends upon a state of doubt which lends sustenance to a systematic and protracted inquiry.³

Planning is the integration of action through the organization of experience. Mental manipulation and exploration precede the execution of the plan. Mental experiment has the advantage of permitting the arrangement of a situation that the investigator might have to wait a long time for the course of natural events to produce and to repeat. There is economy in running through an experiment mentally before carrying it into execution. Through reasoning, the problem may be submitted to hypothetical conditions and the question proved (tested). Thus inferences may be checked and verified.

A fundamental advantage in thinking is derived from the attainment of general principles. Generalization spares the thinker the necessity of going through the gamut of cogitation with each separate occurrence of a typical event. Thus when the mathematician asserts that the sum of the angles of a triangle is equal to two right angles, he saves himself the bother of proving the statement each time he confronts the problem, provided of course that he is fully convinced of the truth of his proposition. A principle explains on a large scale. The ability to generalize is very important for intelligent living, since it

¹L. L. Thurstone: *The Nature of Intelligence*, p. 30. 1924. Ideation is the process of forming ideas. An idea is a thought not directly due to sensory stimulation; its function is symbolic—that is, representative.

²*Ibid.*, p. 12.

³Joseph Jastrow: *Effective Thinking*. 1931.

facilitates that process which is popularly described as "learning from experience." The individual who learns his lesson and brings his experience to bear upon relevant situations which later arise has availed himself of a valuable resource for adjusting to the changing demands of his environment. Ordinarily specificity is only too characteristic of behavior. The person fails to see the connection. The result is departmentalized conduct, inconsistency, conflict. Children must be guided in seeing relationships between the decisions made in their various activities, if we are to expect the decision made in one situation to transfer to another. "We must be concerned with the ideas and ideals which children get from their activities as well as with the activities themselves."¹

II. HOW THINKING PROCEEDS

Introspection, unfortunately, has not shed much light upon the exact nature of the thought process. Some psychologists insist that thought consists of a succession of images, and some psychologists maintain that images are unnecessary, even superfluous. Evidently there is disagreement. Probably thinking sometimes involves images and sometimes gets along without them.

Thinking usually makes use of symbols in order to escape the necessity of dealing directly with things. The employment of number symbols permits the transaction of financial operations without the actual handling of coins and bills. Suppose, for example, that you owe me \$10 and I owe you \$20. We can settle the debts by my presenting you with twenty one-dollar bills and your returning ten of them. But it is much simpler to calculate by means of symbols that when I pay you \$10, our mutual obligations will be discharged.

The most useful symbols are words, through which it is

¹Vernon Jones: *Character Education through Cases from Biography*, p. 3. 1931.

easy to deal with things without the manipulation of the concrete objects. Language developed from the urge to communicate thought. We can think without words, but we can think better with them. The formulation of thought in words is a great aid to its clarification. Many persons think most effectively when they think out loud. Verbalization facilitates the evolution of an idea. Watson even goes so far as to say that all thinking is simply sub-vocal speech.¹ This assertion is somewhat belied by the fact that some people find their thinking proceeding faster than their vocal organs can function. The public speaker must think ahead of his tongue in order to be sure that his delivery will progress without interruption. Certainly speech and thought are intimately related, but they are not equivalent.

The importance of language for thinking is observable in developing children. The acquisition of words increases the span of the budding mental life, and the child learns that the utilization of words saves him effort in the attainment of his desires. Names come to be associated with the various objects with which he has to deal. The rudimentary nature of his vocabulary parallels the obscurity of his thinking. The man with whiskers is Grandpa.² So is every other man with whiskers. The dog is a bow-wow. So is every other animal. Only gradually do objects become more definitely distinguished, as ideas evolve into concepts. The concept of an object is all that the object comes to mean to the individual who contemplates it. Eventually it is discovered that only particular sorts of animals may be properly designated dogs. Then, too, there are collies, bulldogs, spaniels, each of which may be identified, and all of them dogs. "Dog" thus becomes

¹J. B. Watson: *Behaviorism*, Chap. 10. 1930.

²For a discussion of this type of thinking, see the description of stereotypes on pp. 501-503.

a general term applicable to a certain class of animals. When this stage has been reached, thinking can be expanded so that it is no longer limited to thinking of things as concrete objects. Ultimately the mind is able to think in terms of abstractions. "Justice" can then be conceived, covering a host of different acts which resemble each other in so far as they are "just." A definition is the verbalization of a concept, expressed in such a way as to embrace all cases coming within its scope. This very sketchy description of several stages in the evolution of thought is intended to indicate that words are an important tool for the thinking process.¹

Whether images, verbal or otherwise, constitute the stream of thought has been the subject of an extensive controversy. Titchener maintained that thought consists of images, whereas the Würzburg school of psychologists asserted that much of the process is imageless.² According to the latter group, all thinking involves unconscious and therefore unintrospectable factors, impalpable bits of knowledge, determining tendencies, which are imageless. Evidence for this point of view may be observed in two simple experiments.

1:2::8:?

Did you have an image of 16 or did it come without imagery?

cold	—hot	high	—low
big	—small	few	—many
light	—heavy	smooth	—rough
	black	—	?

When you came to black, why did you think of white? The answer lies in the fact that the attitude set up by the

¹See J. Piaget: *The Child's Conception of the World*. 1929.

²This school was directed by O. Külpe at Würzburg, Germany, from 1901-1909.

preceding antonyms, though imageless, was determining your thinking activity. When "white" came to your mind, did it appear as an image or was it imageless?

Spearman states that images are almost entirely absent in his own thought. His thinking is imageless and wordless. His investigations have convinced him that there is no correlation between excellence of imagery and excellence of thought. The proponents of the Titchenerian view are usually those persons whose mental life is rich in imagery, while the supporters of the Würzburg doctrine are those whose mental life is, we might say, defective in imagery. Each accuses the other of being unable to introspect. Images are not indispensable, in fact, they are not even of any appreciable assistance to thinking.¹ In contrast to Titchener's description of thought, Spearman's discussion only mentions images in a casual way, while concentrating upon the comprehension of relations in which imagery is notable by its absence.

In summarizing the controversy, we may say that the thinking process often consists of images, but this is not always the case, for thought can get along without them and sometimes does so more effectively.

III. BELIEF

The products of our thinking are beliefs which function as definite determiners of conduct. A belief is an act in the making. When a belief has become thoroughly emotionalized, it becomes a conviction-provoking loyalty. A belief, to be effective, must be tied up to the emotions; otherwise a person may believe that it is morally wrong to gamble in the stock market and yet proceed to practice speculation. Such a person thinks one way but feels an-

¹C. Spearman: *The Nature of Intelligence and the Principles of Cognition*, p. 192. 1923.

other. It is the affective nature which gives potency to beliefs.

Beliefs are formed and held because they satisfy. Desire plays a large part in their formation and retention. Prepossession engenders credulity. Conclusions exert a magnetic influence, reinforcing anticipation. Desire begets hope, hope expectation, expectation belief.

Lund prepared a set of thirty propositions which were rated by a large number of subjects: first, with respect to how much the individual believed or disbelieved each statement, and second, with respect to how much he wished each statement were true or untrue. Some of the propositions were:

Is a democracy the best form of government?

Do only the good die young?

Will our Republic continue to exist a hundred years from now?

Should all men have equal political rights?

Does the earth travel around the sun?

Is the protective tariff a wise policy for the United States?

Is the Golden Rule a practical concept in business relations?

The average of the belief-desire correlations of all the groups tested was $+.81$, thus showing that there was among the persons concerned in the experiment an inclination to believe what they wanted to believe, the wish being "father to the thought."

It is often asserted that people believe only what they want to believe—which is only another way of saying that our beliefs are determined by our underlying inclinations. The nature of the process through which belief is generated may best be illustrated by reference to delusions which are false beliefs. A person who entertains delusions appears rational enough when the grounds for his strange fancies are discovered. If his premise is accepted, that is, if his

¹F. H. Lund: "The Psychology of Belief," *Journal of Abnormal and Social Psychology*, 1925-26, 20, 63-81.

attitude is understood, then his ideas become readily comprehensible. The paranoiac believes strangely because his complexes are strange. We shall not pause to analyze here "how he gets that way" but shall simply note how the nature of the bias determines the character of the belief.

Clifford Beers, who has told the story of his madness in *A Mind That Found Itself*, describes his fears, upon being incarcerated in an asylum, lest he be brought to trial for certain imaginary misdemeanors which he considered serious enough to condemn him to death, if his case ever came before a tribunal. He lived in constant dread of the talons of the law. When we appreciate this background, we can realize how an innocent remark of his brother's precipitated a state of genuine alarm. "You are looking better," his brother told him, "and getting stronger. We shall straighten you out yet." Straighten him out—ah, that meant he was soon to be hanged or electrocuted for his crime—thus to be straightened out, in the horizontal posture, to eternity. No wonder he became excited.¹

Delusions of jealousy are very common. Here is a typical case:

A man suspected his wife of infidelity because, when he rushed into the house unexpectedly one day, she looked surprised and startled; when he called her on the phone, the line was busy; when he announced he was going away on a trip, she seemed delighted at the prospect.

False beliefs, of course, are not limited to the inmates of asylums for the insane. There are persons at large who entertain delusions on a grand scale. Commander William A. Allen occupied the pulpit of a Los Angeles church where he instilled terror into the hearts of the congregation by describing what Einstein's visit to California really

¹Clifford Beers: *A Mind That Found Itself*, p. 72. 1923.

meant. His speech is described by one of the audience in these words:

The things he told were enough to . . . prove, among other things, that Einstein is here in the interest of communism, and that he has facts to prove that within the past few weeks he said exactly what he was told to say about pacifism by Joe Stalin and his bunch. He told things like this—that a large ranch was being gotten in shape in Riverside County as one of the communist centers for arms and ammunition, and that special basements are being constructed so thick and strong that they can only be gotten into by dynamiting, and a lot of it at that. Also, that a lot of canned goods, labeled as being made in Argentine, is coming from Russia; that two societies, the Women's International League for Peace and the American Association for Outlawing War, are the direct tools of the Russian communists. He claims they are thoroughly organized all over the world and preparing for "Der Tag"—which will be a terrible revolution, and that American business men are so blinded by their pursuit of the dollar, that they are blind to the menace. Well, the Lord help us if it's true.¹

A suspicious attitude predisposes an individual to misunderstand his fellows, through inclining him toward the misinterpretation of their behavior. It is true indeed that sometimes there are adequate grounds for suspicion but in many instances slight evidence is accepted as damning proof. Innocent remarks may be converted into malicious insults. I recall a situation where a young man was the first to arrive at a party given in a neighbor's home. The charming hostess ushered him into the living room where they engaged in conversation. The next guest to appear was an attractive young lady. The hostess, anxious for a chance to supervise the servants in their final touches on the refreshments for the evening, asked the young man if he would be willing to entertain the charming lady for a while. He replied, "I shall be delighted." The hostess

¹A letter quoted to the editor, in the *Christian Century*, February 18, 1931.

took the conventional remark to mean that he was glad to get rid of her for somebody with more appeal, and, consequently, she brooded over her injured feelings. Thus suspicion manufactures its own provocation and reinforces itself through its own beguiling distortions.

Right belief and credulity refer to habits of mind as well as to standards of evidence. "Thinking straight is essential to seeing straight. The evidence grows out of the attitude far more than the attitude results from the evidence."¹ Some people are so entrenched in their own convictions that they resist the truth. It is easy for an anti-vivisectionist, for example, to discredit the value of animal dissection in the progress of medical research.

Most people believe too much rather than too little. Credulity is rampant. Ours may be a scientific age, yet this era is the heyday of the fortune tellers. One million three hundred thousand radio listeners in a year responded by mail to Evangeline Adams's tri-weekly broadcasts. In New York City twenty-five million dollars a year cross the palms of clairvoyants. Millions of adult Americans believe that the future can be foretold by occult means. Many others are casting about for some excuse to believe in order to bolster their wish for security.

The most striking aspect of the belief in astrology is the ease with which so many people accept the premise on which the system stands. Persons who are otherwise intelligent, who habitually draw reasonably correct conclusions from given data, never balk, somehow, at the notion that stars give off something that makes human beings what they are and what they are to be. They stake their fortunes on a supposition they do not even try to test, accepting without question the statement that a heavenly body makes them tall or short, rich or poor, well or ill. Persons who make sure that a radio works before

¹Joseph Jastrow: *The Psychology of Conviction*, p. 113. 1918.

they buy it will nevertheless pay money to anyone who promises to decide the most important issues of their lives. "It is a gaudy paradox that a race whose name is a byword for shrewdness, caution, and practical guile should give over in droves to a footless will-to-believe. Most successes in prophecy are remembered, failures forgotten. The stock answer is, that the stars are never wrong, but that astrologers may be, which is admittedly an argument to end all argument."¹

The richest field for the study of credulity lies in medical quackery, whether it be a movie star who attributes her perfect teeth to some particular brand of toothpaste, or a distinguished foreign physician who recommends yeast for a specific ailment in such a way as to allow the advertiser to seduce the public into believing that a cure for staphylococcic infections must be a panacea for all ills.

The tenacity of belief in the face of disquieting evidence is illustrated in spiritism, a thriving cult in modern times. Two little girls, Kate and Margaret Fox, of Hydesville, New York, learned how to crack their big toes. Their parents and neighbors took the sounds for spirit rapping. The Fox sisters capitalized on their discovery, giving demonstrations as mediums in public performances. For forty years they were regarded widely as gifted with special powers of revelation. They feared to expose their trickery because they dreaded the wrath of the religious mob and the anger of their sister Leah who had used the girls to make money. In 1888 they summoned the courage to show a New York audience how it was done. Reuben Briggs Davenport wrote a book on the inspiration he derived from the exposé entitled *The Death-Blow to Spiritualism*.² It was an amusing title: the death-blow

¹Travis Hoke: "The Heyday of the Fortune Tellers," *Harper's Magazine*, January, 1932.

²Published in 1888, as the true story of the Fox sisters.

produced very few results. Spiritualism went merrily on.¹

Logical attainment in one direction is no bar to extravagant conclusions in another. Natural intelligence is no barrier to the propagation of error. The person who believes in miracles, exceptions to the causal order, appeals to testimony which under normal circumstances he would himself distrust. Beliefs are so complicated by personal values as to encourage uncritical judgment. Most of us accept the conventional fallacies. We believe that Nero fiddled while Rome burned, though Nero was not in town, and there were no fiddles in those days. We believe what we are told to believe.

The newspapers build up myths around popular heroes, to which the public gives ready credence. The modern newspaper has made and unmade heroes at will.² The modern publicity agent can assure stardom to mediocrity, depending upon his own wiles and upon the gullibility of the public.³

With so many factors predisposing us to embrace absurdity, it is surprising that our conduct makes sense at all. It is certain that the achievement of a logical mind requires long discipline in exact science until habits of careful inquiry and cautious conclusion become second nature. A discussion of psychology and logic will indicate some of the means that may be employed to insure sound thinking which is essential to sane living.

IV. PSYCHOLOGY AND LOGIC

Psychology touches Logic intimately in the study of rationalization. Thinking is largely characterized by

¹C. W. Ferguson: *The Confusion of Tongues*. 1929.

²Silas Bent: *Ballyhoo*. 1927.

³D. Freedman and Harry Reichenbach: *Phantom Fame: The Anatomy of Ballyhoo*. 1931.

emotional interest in conclusions. For example, Eddington deduces religion from the fact that atoms do not obey the laws of mathematics, while Jeans deduces it from the fact that they do.

The fact that a person is rationalizing does not prove that his conclusions are erroneous, but it should render them subject to suspicion, in the sense only that they should be investigated. It is well known that errors in observation may often be traced to intense emotional slants. The scientist who becomes attached to his theories fails to notice facts which contradict them. He is pre-disposed against giving due weight to the objections of his opponents. Many interminable disputes never lead to any result, just because of the passionate enthusiasm of those who take part in them. The perverting influence of an intense emotional slant on the judgment of a matter calling for cool philosophical deliberation is illustrated in the reaction provoked in a learned reader by Spinoza's *Tractatus Theologico-Politicus*: "It is a Book full of curious, but abominable discoveries, the Learning and Inquiries whereof must needs have been fetched from Hell. Every Christian, nay, every Man of Sense, ought to abhor such a Book. . . . I have read that Book of Spinoza with application from the beginning to the end; but I protest at the same time before God, that I have found no solid arguments in it, nor anything that could shake, in the least, my belief of the Gospel. Instead of solid reasons, it contains mere suppositions". . . .¹ The metaphysician, according to Rignano, starts with the desired conclusion and goes back in search of the necessary premises from which it may be deduced. It is common practice among philosophers to present reality in conformity with certain intimate and profound aspirations. What

¹From Frederick Pollock: *Spinoza; His Life and Philosophy*, Appendix, p. 403. 1899. By permission of The Macmillan Company, publishers.

matters most of all to the thinker is not the truth, but rather the object of his faith.¹

An error sometimes committed by persons engaged in evaluating the beliefs of others is the genetic fallacy: the assumption that a conviction is invalidated as soon as its origin can be traced. Thus a man may offer the criticism that athletics are overemphasized in our colleges. His view may be treated with respect until a curious friend discovers that the critic failed to make a college team. This discovery is supposed to "explain everything"; indeed, it is supposed to "explain away" the man's view on sports. Of course the validity of a belief is not discredited by the mere fact that it originated in some personal experience. Individuals who jump to the conclusion that "explaining" means "explaining away" are committing the genetic fallacy. It is an error to which psychoanalysts are particularly prone.²

Psychology describes how we incline to think; logic, how we must think if we would think correctly. Knowledge of the rules of straight thinking and attention to the pitfalls common to the cogitative activities of human kind combine to promote adherence to the principles underlying the intelligent regulation of life. Logic is not merely a theoretical study, as the naïve assume; on the contrary, it is one of the most vital sciences. Ordinary thinking observes the sequences of events without checking against a control. Thus a person attributes the cure of his cold to a bottle of pills, when any number of other factors may have been responsible, such as diet, sleep, sunshine, or just the plain curative resourcefulness of nature. As uncontrolled observations accumulate, folklore is developed, which curiously enough often passes for common sense. An amusing example of such uncontrolled empiricism is the

¹See E. Rignano: *The Psychology of Reasoning*, p. 229. 1923.

²See Sigmund Freud: *The Future of an Illusion*. 1928.

saying: "Stuff a cold and starve a fever." Originally the counsel read: "If you stuff a cold, you'll later have to starve a fever." To such trivial variations we entrust our lives.

Reasoning is a mental experiment. Sound reasoning must be subject to the rigorous conditions of scientific control. Scientific thinking observes the rules of logic which are the canons of science.¹ It is vital that we learn to think straight. Crooked thinking is costly. The tendency to go to extremes in health fads leads people to believe that if a little of something is good, a lot of it is better. One man, advised to drink a quart of milk daily, complained to the physician that his stomach was upset. Investigation revealed he was consuming a gallon of milk a day on the theory that he was assuring himself of four times the benefit of one quart. Another man whose physician directed him to take a bottle of mesothorium water, was so convinced of its curative power that he continued the treatment for a year on his own responsibility, assuming that if a little was good, more would be better. He drank unheard-of quantities of the water. Symptoms appeared which led to an examination, and his bones were found to be loaded down with mesothorium. He died of an overdose of mesothorium, but it might be more accurate to say that he died of faulty logic.

How reasoning and experimentation go hand in hand is illustrated in the steps by which Friedrich Bergius, German scientist, succeeded in making gasoline from coal. Coal is a hydrocarbon with the proportion of hydrogen to carbon 1 to 16. Oil is a hydrocarbon with hydrogen in the proportion of one to eight. Double the hydrogen in coal and you have oil. With this pattern before him, Bergius in 1911 went to work in his laboratory at Heidelberg. There is no chemical formula for coal in general. No two coals are alike. Bergius began by

¹See C. H. Patterson: *Principles of Correct Thinking*, Chap. 1, "Logic as Scientific Method." 1937.

getting samples of coal from all over the world—thousands of samples—and studying their chemical and physical structure until he knew more about coal than any other chemist. Then he proceeded to make coal in his laboratory. He mimicked the geologic processes of nature to make coal from plant fibers. After two years of making synthetic coal he was ready to try to drive more hydrogen into his coal. He tried to drive hydrogen with enormous pressure into hot lumps of coal in a closed steel tank. No result. Nothing but coke. Too much heat. He had to find a way to get coal to absorb hydrogen without heating coal to the point of coking. He ground the coal and mixed it with oil and then tried hydrogenation at a temperature under 800 degrees. He got what he was after. The coal liquefied and became oil. The little oil he had mixed with the powdered coal acted as a heat distributor. He kept on until he found he didn't need to mix the powdered coal with oil, but could use tar to form a paste which he pumped into steel containers and heated. Hydrogen was forced in while the mass was mechanically stirred. After a few hours the contents were withdrawn—gas, liquefied coal, untransformed coal and ashes. By careful cooling various petroleum products were condensed, oil at a high temperature, gasoline at a lower.¹

Scientific thinking depends upon a certain type of evidence afforded only by controlled observations. The fact that a person gets well under a certain mode of treatment proves nothing, for he may have recovered without it or even in spite of it. Is quinine good for colds? The scientific test is to give quinine to one group of persons suffering from colds and to avoid its use with another group also afflicted with colds, to keep accurate records of the recoveries, and then to determine, by a comparison of the records for the two groups, whether quinine is useless, beneficial, or harmful. This simple method of testing the value of drugs did not come into use until the nineteenth century, and there are plenty of people today who govern their selection of remedies for their ills without any resort to controlled observation. The scientific method has

¹Louis M. Lyon, in the *Boston Globe*, July 8, 1936.

penetrated modern thought to only a slight extent, whether it be in medicine, politics, economics, religion, or ethics.¹

The achievement of sound thinking is important. It depends, at the outset, upon a recognition of the fact that mental data are not isolated but connected. Reasoning is the process by which the mind passes from a given fact to other facts implied through logical relations. The farmer's wife who said to the druggist, "Now, be sure and write plain on them bottles which is for the horse and which is for my husband. I don't want nothin' to happen to that horse before the spring plowin'," suggested certain implications which may not have been intended. The individual infers, "carries over," in going beyond what is surely known to something else accepted on its warrant. He draws conclusions, or better still, he leaps to them. The demands of logic are satisfied when the inferences are made with due respect for consistency. By following such methods as logic suggests, for logic is the "logy" or method which guides our thinking and experiment, we reach conclusions as sound as it lies within our capacities to achieve.

The habit of scientific thinking should be inculcated in our educational training. Students should learn the habit of accuracy in all operations, including calculation, observation, and report. They should develop intellectual honesty by refraining from exaggeration and by admitting they are wrong when proved so. They must cultivate open-mindedness by revising opinions through the assimilation of new data. They must acquire the habit of suspended judgment by refusing to jump to quick conclusions. They must learn to look for true cause-and-effect relationships. Students must develop the habit of criticism, especially self-criticism. This does not mean fault-finding but rather the practice of careful evaluation. Then the scientific attitude, thus established, must be

¹See Howard W. Haggard: *Devils, Drugs, and Doctors*, pp. 350-351. 1929.

transferred by training in generalization to the situations of everyday life.¹

Test yourself concerning these assertions. Are they based on controlled experimentation? How would you proceed to verify them?

The lessons of the elementary school teach honesty, accuracy, thoroughness, and self-control.

Fraternity "Hell Week" is a valuable custom because "it does a man good to be made out a fool."

Fairy stories are good for children because they develop the imagination.

There should be a moratorium on preaching because sermons are ineffective for reforming character.

Next to the training in getting on with other people at close quarters and the moral improvement that comes from fraternity ideals, the advantage most widely and justly claimed for fraternities is training in self-government.

Reasoning has to start with some assumption, proved or unproved, some premise or hypothesis, which must be believed and asserted. The fundamental problem of logic, then, is to seek valid premises upon which, as a basis, reasoning may proceed. Induction is the method by which a general principle is derived from a study of particular cases—from the fact that each time there is a ring around the moon, it rains, it may be concluded that, as a general rule, it will rain when there is a ring around the moon; deduction is the method by which the rule is applied to a particular case—since there is a ring around the moon, it is going to rain now. The problem of induction is to establish the truth of the premises from which deductions are to be made. Classification is the intermediate link between the inductive and deductive procedures.

¹V. H. Noll: *The Habit of Scientific Thinking*. 1935. Bureau of Publications, Teachers College, Columbia University. Noll has devised a test for scientific thinking, entitled *What Do You Think?* published also at Columbia.

For a test of scientific aptitude see D. L. Zyve: *Stanford Scientific Aptitude Test*. 1930.

The collection of instances in induction must be carried out with due respect for certain requirements. It is obvious that life is too short to allow for the enumeration of all possible instances. Samples, therefore, are selected. The sampling must be fair. There is a strong tendency to choose the instances to suit a given bias. Thus negative instances are readily ignored. The man who insists that rich people are stingy fails to notice cases of generosity on the part of the wealthy. Then, too, there is the danger of taking the exceptional as typical. Thus the advertisement of the man who made \$110 the first day selling corn poppers gives the impression that he made \$110 every day. The instances must be significant. When a lawyer was informed that three persons had seen his client commit the crime, he replied: "That's nothing. I can produce 300 witnesses who didn't see him do it." Enough instances must be covered to give a fair sampling, otherwise the particularistic fallacy may be indulged in by generalizing on the basis of inadequate evidence. Thus a person may consider all Chinamen crooked because he was once cheated by his laundry man.¹ "All Indians walk in single file," reported the traveler. "How do you know?" queried the listener. "Well," was the retort, "the only one I ever saw, did." Such is the logic upon which our prejudices are born and nourished.

The old-fashioned straw vote, in which millions of ballots were sent out at random, met its finish in 1936 with *The Literary Digest's* miscalling of the Presidential election. The newer method being developed by Elmer Roper of *Fortune*, by George Gallup of the American Institute of Public Opinion for the newspaper feature, "America Speaks," and by Henry F. Pringle for the *Ladies' Home Journal*, on "What Do the Women of America Think?" is designed to overcome the straw vote's fatal weakness—

¹See E. S. Bogardus: *Fundamentals of Social Psychology*, p. 288. 1924.

non-selectivity.¹ The present system is based on the simple theory that groups of people in similar circumstances think alike. Hence if you can find out what some of its members think, you can know what the whole group thinks. Put all the groups together in their correct proportions, and you know what the American people as a whole think. Men and women representing all classes, degrees of education, religious beliefs and political prejudices are interviewed and their votes tabulated, on such matters as easier divorce laws, "mercy" deaths, and the New Deal. Inquiry penetrates every part of this broad and varied nation: the miner's shack as well as the millionaire's home; the shopkeeper, the college professor, the housewife, the W.P.A. worker and the unemployed are questioned. The answers are tabulated with mathematical precision. The instances are selected with the aim of fair representation for all points of view. The application of statistical methods makes such surveys accurate in their interpretations of what people are thinking about various timely issues.

Faulty classification, "drawing the line," is responsible for a number of fallacies. Thus a person may insist that a man must be either sane or insane, not realizing that variation is continuous, sanity and insanity merging into one another very gradually, all of us partaking in some degree of each. Speaking more exactly, a person's behavior is more or less sane or insane—it is all a relative matter. "Drawing the line" is well-illustrated in this resolution by the Methodist Federation for Social Service, deploring a neutral attitude toward the economic order:

The time has come once again when organized society must change its way of life or go down to decay or destruction. The spirit of Jesus and the Will of God are on one side or the other. It is a joint question of economic fact and moral choice. Either

¹See *Life*, January 3, 1938. Also *Ladies' Home Journal*, February, 1938.

the capitalist economy has broken down or it has not. Either its basic principle is right or it is wrong. Either it promotes the development of Christian values or it destroys them. How long does the church go limping between two opinions? If God is our God let us serve Him. If Mammon, then frankly serve him. But we cannot do both.¹

It is convenient to classify people into sheep and goats, the blessed and the damned, but human nature does not fall readily into such discrete categories. If an individual is "bad," we tend to think of him as all "bad," and so atheists are not allowed to testify in some courts on the ground that all atheists are liars. Type psychology is based on unsound logic, involving several fallacies. There is the fallacy of false simplicity which leads the uncritical to believe that traits are discontinuous and simple in organization, the mistake just described above. There is the fallacy of verbalism which consists in believing that naming a thing constitutes proof of its existence as an entity. There is the fallacy of the particular case which a person commits when he finds what he is looking for when it really is not there.

Overassertion is another mistake likely to be committed in induction. The conclusion drawn from a sampling of cases should be in terms of tendencies rather than absolutes—that is, an investigation may indicate that there is a tendency for a given religious sect, we shall say, to be hidebound; it is saying too much to assert that all members of that sect are inevitably hidebound.

One of the most common dangers in induction is hasty generalization. Being impatient, we rush to conclusions before there is enough evidence in to justify judgment.

The effect such an inductive fallacy exerts upon our psychological reactions is illustrated by the operation of

¹Quoted by Jerome Davis: "Capitalism and the Church," *Harper's Magazine*, January, 1937.

stereotypes. Stereotypes are our pictures of typical people, such as the Southern Colonel with his mint julep. They are developed by an overgeneralization from a particular case. Our preconceptions serve as stereotypes to which we fit what we behold. The eyewitness does not get a naïve picture of a scene, for he brings something to the scene which results in a transfiguration of the event. His experience is not merely given, it is partly made. The role of the observer is always selective and usually creative. Our preconceptions affect deeply the entire process of perceiving. In most of our observations we do not notice all the details, but pick recognizable signs here and there which suggest ways of filling in the gaps in accordance with our stereotypes.

The following stereotypes will serve to crystallize definitely the preconceptions with which we are all equipped. How closely do they approximate your own mental pictures of these representative characters?



Clergyman



Farmer



Professor

(Drawn by Warren Sillen.)

It must be kept in mind that our stereotypes, in general, do not conform accurately to reality but, rather, are caricatures, subject to gross exaggeration. The stereotype of the reformer, for example, does not do justice to many of the noble persons who have devoted themselves to the amelioration of conditions in our society. The lack of personal charm in the stereotype of the reformer is the

product, in part, of the hatred felt by the ignorant for those individuals who dream of a better order of things and who are willing to sacrifice any superficial popularity in order to bring their aims to fruition.



What some people think a missionary looks like, though they never saw one fitting this stereotype.

(Drawn by R. Wilson Hammell.)

A similar stereotype, equally distorted in its conception, is that of the missionary, who is represented as a cadaverous individual clad in a frock coat too short in the sleeves, carrying a very bulging umbrella in one hand and a hymnbook in the other.

This picture of a missionary . . . has made its impression and forms part of the strange mental furniture stored at the back of the head of the simple souls who today spend their evenings at the movies and their Sundays in reading comic supplements.

Then came the novel and the drama wherein the missionary was shown to be essentially a hypocrite and coward, in marked contrast to the lady of fortune or the gentleman adventurer, who might be a dope addict and a fugitive from justice but who was still one of nature's noblemen.¹

The college professor, as a stereotype, is a simpleton who dashes with his net through fields of daisies in pursuit of

¹Henry A. Perkins: "The Case for Foreign Missions," *The American Mercury*, February, 1931.

butterflies. His large glasses fairly conceal his emaciated countenance. When he speaks, it is only in words of five syllables, consciously articulated with stilted precision. Under one arm is a bulky volume into which he peers at every opportunity. He does not watch where he is going—in fact, the poor absent-minded fellow does not know where he is going. He is the perfect fool.

The artist, according to the popular conception, is a picturesque, effeminate person, with long hair, a black hat, a flowing tie, and a flabby physique. He is eccentric, indolent, and lax in his morals.

Such are the fictions by which we organize our observations of reality. Inevitably, our accounts of what we notice are often more revealing of ourselves than of the event under observation.

If what we are looking at corresponds successfully with what we anticipated, the stereotype is reinforced for the future, as it is in a man who knows in advance that the Japanese are cunning and has had the bad luck to run across two dishonest Japanese. . . . If the experience contradicts the stereotype, one of two things happens. If the man is no longer plastic, or if some powerful interest makes it highly inconvenient to rearrange his stereotypes, he pooh-poohs the contradiction as an exception that proves the rule. . . . But if he is still curious and open-minded, the novelty is taken into the picture, and allowed to modify it.¹

Thus do our prejudices evolve as stereotypes with no regard at all for the demands of inductive logic. We pay the price for our disregard in failing to adjust ourselves to a real world in which real people, all of them different, live.

Deduction consists in showing the relations of propositions to each other. Deductive reasoning starts from premises which are propositions, proved or assumed, serv-

¹From Walter Lippmann: *Public Opinion*, pp. 99-100. 1922. By permission of The Macmillan Company, publishers.

See also L. W. Doob: *Propaganda: Its Psychology and Technique*, pp. 35ff. 1935.

ing as a ground for a conclusion. The more general premise, which contains the predicate of the conclusion, is called the major premise; the more particular premise, which contains the subject of the conclusion, is called the minor premise. The major term and the minor term are logically related to each other through the middle term which is common to both, in such a way as to imply a conclusion. The three propositions, the major premise, minor premise, and conclusion, constitute a syllogism, the syllogism being the unit of deductive inference. If the premises are true and the reasoning is valid, the conclusion must be true. Syllogistic proof presupposes the truth of its premises.

He must be intelligent because he is a college graduate.

Deductive arguments are not always formulated syllogistically, for in practice part of the argument is omitted, but arguments are more apt to conform to the laws of logic if they are exposed in the clear light of the syllogism. Take the example above:

All college graduates are intelligent. (*Major premise*)

He is a college graduate. (*Minor premise*)

He must be intelligent. (*Conclusion*)

The middle term is "college graduate." The absurdity of the major premise at once becomes apparent, invalidating the argument at its initiation. It is helpful to preface the major and minor premises with the word "if," thus calling into question the validity of the premises for the purpose of checking them before the argument proceeds. If all college graduates are intelligent—but they are not, and that is that. Special care must be taken to be sure that the meanings of terms and relations remain unchanged throughout the syllogism.¹

¹See R. S. Woodworth and S. B. Sells: "An Atmosphere Effect in Formal Syllogistic Reasoning," *Journal of Experimental Psychology*, 1935, 18, 451-460.

Whoever obeys laws submits to a governing will.

Nature obeys laws.

Therefore, nature submits to a governing will.

The syllogism is invalidated by the fact that the term "laws" is used in two different senses.

Illogical conclusions might often be avoided by a full, accurate statement of the syllogism. A very common error is the following:

Great men have been ridiculed.

I am ridiculed.

Therefore, I am a great man.

All great men do not coincide with all who have been ridiculed, and I may be in the class of the ridiculed without entering the class of the great. From the fact that great men are often unpopular, some people are so fatuous as to mistake their own unpopularity for a sign of greatness. The attractiveness of the conclusion encourages the perpetration of such an illogical bit of reasoning.

Another prominent deductive fallacy is that of begging the question. Some psychologists, for example, may argue that mind is not real because it cannot be measured. They assume that only the measurable is real, which is just the point that is in question. There are some logicians who contend that deduction inevitably begs the question, since the major premise assumes what is necessary for the conclusion.

Another favorite error consists in an attempt to establish or to discredit a proposition by appealing to the emotions and prejudices of the audience. Thus a debater may cast aspersions upon the character of his opponent in order to undermine his argument. In this way, political arguments all too frequently degenerate into "mud-slinging." The appeal to prestige, likewise, is based on arousing an emotionalized acceptance of a proposition, whether it be a

citation of Biblical authority or the mention of some person belonging to an exclusive social set. Testimonials of prominent society folk who recommend Whatsits Bread because it supplies the vitamins necessary to vigorous health illustrate the technique.

A sound argument must, by all means, be fair. Absurdities are believed and uttered daily by the majority of the human race. One cannot refute theism by refuting absurdities held by theists any more than one can refute atheism by refuting absurdities held by atheists. It is an axiom that no idea is refuted unless it is refuted in its best form.

It is clear from the foregoing that many deductions are distorted by the fact that the premise involves an emotional predisposition, better known as a complex. A complex is a system of emotionally toned ideas which functions as a tendency to produce actions of a certain definite character. When a person with a party bias on political matters considers a proposed measure, the attitude he adopts is apt to be independent of the merits of the issue. He naïvely imagines that his opinion is derived from a cool weighing of the pros and cons of the situation, for it pleases him to believe that he is rational in his thought and conduct. In reality, his party complex predisposes him to accept the arguments advanced by his colleagues, and to discredit the arguments offered by his opponents. The complex operates the more effectively because the individual is unconscious of its important role in his actions. A person in such a situation invents reasons to account for his convictions, reasons which are insufficient and illusory. This process of self-deception, through which the individual conceals the real grounds of his decisions by a system of adventitious props, is termed "rationalization."¹

What is now technically known as a complex used to be

¹Bernard Hart: *The Psychology of Insanity*, Chap. 5, "Complexes." 1929.

called a "bug." The vegetarian bug has become the anti-meat-eating complex. Each of us is a "nut" about some special interest or hobby.

Every "red-blooded" person can be set in a furor of excitement over some issue which strikes "close home to him." We all have our favorite loves and pet aversions which determine our thinking and our behavior. Our complexes become the very core of our being, calling insistently for promotion and defense.

Some people are fanatically opposed to the use of tobacco in any form by anybody. Smoking is made a moral issue. People who are anti-this are often anti-that, too. At one of the meetings of a church assembly, the group first assailed the "wet press" and then went on record as "showing its strong disapproval of the boldness of the tobacco interests in advertising their wares over the radio, in newspapers, magazines, and on billboards." It was voted to protest to the radio companies. Regardless of the "cause," most people do not become emotionally excited over tobacco. Alarm, exaggerated statements, vehement opposition indicate the presence of a complex. One medium for giving expression to anti-nicotine sentiments is to write an editor. Here is a sample:

To the Editor:

Whereas: There has been an increase in the use of cigarettes amongst the youth and the ladies of our communities, and

Whereas: This increase has been due to the advertising in our magazines and on our billboards and other pernicious publicity to a large extent, and

Whereas: We believe this to be contrary to the best moral and Christian principles of our age, therefore

Be it resolved: That We, the Ladies' Class of the Perkins Grove Church, LaMoille, Illinois, go on record as being opposed to your methods of allowing such advertising to appear in your magazine, and

Be it further resolved: That unless this ceases immediately, we

as a congregation shall cease to support your publication by refraining from subscribing to it and also discourage its circulation amongst our friends and acquaintances, and

Be it further resolved: That a copy of the above resolution be sent to all magazines of your standing which permit such advertising.¹

—Secretary

—President

The denouncer, wherever he storms, betrays a strong affective attitude toward the ideas in question. "His vitriolic language serves to illumine, not the issues under discussion, but the character of his mental reaction to the opposition."² Wherever discussion of a topic degenerates into a denunciation of personalities, wherever feelings are expressed which are all out of proportion to the apparent triviality of the occasion, whenever a sense of humor seems totally absent, you may be sure that a complex is operating. Thomas Paine, author of *The Age of Reason*, used to be called a "filthy little atheist," an injustice undoubtedly provoked by a deep-seated bigotry in some believer who was only too willing to convert his difference in dogmatism into an attack upon the infidel's character.

Partisanship often seeks religious sanctions. God has been identified, at one time or another, with slavery, war, and the Republican party. One lady wrote to the *Boston Herald Traveler* just before the presidential election of 1928 that she was voting for Hoover because, as she stated, "God is with Hoover."³ The Lord even has a hand in the weather, though New Englanders might hesitate to believe it. Dr. Gray, President of the Moody Bible Institute, is convinced that the Deity, realizing the shortcomings of the

¹*The Forum*, February, 1930.

²A. H. Kamiat: "The Subjectivity of the Believer," *Social Science*, 1929, 4, 217-221.

³See W. F. Vaughan: "An Experimental Study of Political Prejudice," *Journal of Abnormal and Social Psychology*, 1930, 15, 268-274.

Republican administration in handling the farmers' plight of 1930, solved the agricultural question over night by means of the drought, which increased the price of corn and disposed of the wheat surplus.¹

The tendency to take sides under the prompting of complexes precipitates the mind into embracing conclusions even before the facts are ascertained. When C. E. Bechhofer Roberts's picture of Dickens in *This Side Idolatry* was published, buckets of wrath were emptied upon him by critics who were later forced to admit that they had not read his book before denouncing it. "Big Bill" Thompson, when he was Mayor of Chicago, found time to anathematize Rupert Hughes for his biography of Washington:

"Hughes is a damned liar," declared "Big Bill." "He is a cheap skate trying to get some personal publicity. . . . He lied about Washington's personal habits. In any other country they would put him where he belongs." A reporter asked the Mayor if he had read the book. "No, I haven't," he shouted. "I wouldn't read any part of it. He's just a muckraker for profit."

It requires the long discipline of a high intelligence to preserve an open mind. Only the ignorant can be dead sure of themselves. Where adequate rational grounds are absent, the mind skids joyously to convictions that are none the less binding because they precede a search for the facts. Indeed, the search will probably never take place.

With this brief review of some of the principles of logic in mind, let us examine more at length two prevalent cases of faulty reasoning—analogy and causation.

Analogies, to be valid, must be comparisons in respect to vital similarities. Unfortunately, analogies are often

¹*The Literary Digest*, September 27, 1930.

to be sure

employed with little regard for this demand. The use of an analogy is based on the assumption that because N has the properties A and B which belong to M, it must also have the property C which belongs to M. But things which are alike in some respects differ in others. The Communists are in favor of revolution. Should a person who commends the American Revolution be logically compelled to espouse Communism? The points of resemblance must be real and basic, the more the better, with no point of crucial difference. The critical question may be put thus: Are the two items similar in precisely those respects that are significant? When a person has suffered some dreadful misfortune, a friend may console him with the suggestion that "lightning never strikes twice in the same place." Is that a fair analogy? If you want to keep young, advises a doctor, live as the young do. Perhaps, too, you can get rich if you live as the rich do, but, unfortunately, it does not work that way.

To the naïve person, the argument by analogy is apt to carry conviction, even though the points of resemblance are few and unessential. Superstitious thinking is based on the most strained and remote analogies. Thus it has been thought that a person born in the summer will be taller because the days are longer; that lungwort will cure pneumonia because the leaves resemble the surface of the lungs; that bear's grease will prevent baldness; that a person born under the planet Jupiter will be jovial, Jove being the Greek name for Jupiter—Jupiter, Jove, jovial—such is the logic of the "science" of astrology. Consolation for misfortune is derived from the fact that "it's a long lane that has no turning," or "every cloud has a silver lining," or "it's always darkest before dawn."

The following analogies have been gathered from various sources. Examine them carefully to determine whether they are legitimate.

The salaries of school teachers should not be cut during the depression because the lower pay will make it impossible for the schools in the emergency to train the youth to maintain the ideals which have guided our people in the past. As well should we expect the householder, when a fire is raging in the next block, to cancel the insurance on his home.

Nobody can be healthful without exercise. For a state an honorable war is the true exercise. A foreign war is like the heat of exercise, and serves to keep the body politic in health.

Attempting to deal with unemployment by plunging into naval building is about as sensible as would be an attempt to improve medical standards by loading the water supply with typhoid germs.

The News wants peace as ardently as any signer of any anti-military petition ever circulated, but it does not believe that the way to check a forest fire is to cut off the water supply, or that the way to prevent disease and physical injury is to abolish all antitoxins and to destroy all surgical instruments.

Billiard cushion shows why fresh—Gas is better. . . .
 "See," . . . says the scientist, "the newer and livelier the billiard cushion, the more pep it gives the ball. Gasoline is like that—the fresher it is, the more pep and power it gives a car."

The popular logic of causation ^{not causation} also deserves examination. If one event follows another, the temporal sequence is interpreted as cause and effect. Thus the wealth of the United States is attributed to the superior intelligence of the Nordic settlers, neglecting the consideration of the fertile lands, the mineral resources, and other like factors; or the poverty of Russia since the World War is blamed on Bolshevism, disregarding the blockades, the droughts, and the war losses. In inductive reasoning this error is known as the fallacy of *post hoc, ergo propter hoc*; in deductive reasoning, *non sequitur*.

Examine the following samples of reasoning from cause to effect:

If the Republican party is going to take the credit for the prosperity of the Coolidge era, they should be willing to shoulder the blame for the depression of the Hoover era.

After Princeton's disastrous season in football in 1931, President Hibben resigned. Two days after Harvard lost the football game to Yale in 1932, for their second consecutive defeat, President Lowell resigned. It was a good thing for President Angell that Yale won that game, for the victory redeemed a poor season at New Haven.

When Mr. O'Toole visited Niagara Falls, he was much impressed with the power house in which, he understood, was "the machinery what pumps the water for the falls."

In 1835 the appearance of Halley's comet was followed by death and destruction over the whole world. Immediately after the comet became generally visible in the old world the bubonic plague, generally known as the "black death," broke out in Egypt. In the city of Alexandria alone 9000 persons died in a single day. By the Moslems this calamity was generally attributed to the influence of the comet.

Knowledge of the laws of logic is no guarantee against fallacious reasoning. Prejudice may confound the thinking of the best informed. A learned man may defend unsound views with fool-proof logic.¹ At the same time it should be noted that true conclusions may possibly be supported by unsound arguments. While the study of logic cannot assure straight thinking, still, no one will deny its advantages in the encouragement of accurate reasoning. It is something to be headed in the right direction.

¹R. H. Thouless: *Straight and Crooked Thinking*. 1932.

V. EDUCATION FOR THINKING

Straight thinking is not a gift but an achievement. Training in logic is not the whole story. There must be not only a knowledge of the rules but also a strong desire to apply them. Almost anybody who is set to detect error will see the flaws in the following:

Will Rogers: I did not register to vote. If this country is not run right, I won't be to blame.

You wouldn't eat a green orange, why drink unripe ginger ale?

It is wise to vote for the party in power because it represents Experience; it is unwise to vote for the party out of power because it represents Experiment.

But would almost anybody, without being warned to beware, notice the fallacies so neatly hidden in some of these statements? The answer must be an unequivocal "No." People generally are not alert in such matters, especially because they are not interested so much in truth as they are in the reinforcement of their own biases. Our minds fall into traps readily in judging even the plainest things, so that we are capable of coming to wrong conclusions about self-evident facts.

The success of democracy depends upon the straight thinking of the citizens who are forced by the exigencies of politics to consider the merits of various public questions. It is obvious, even to the casual observer, that the decisions of the average citizen are the products, not of sound thinking, but of emotional attitudes touched off by stereotyped catchwords. Economic issues are not weighed; they are espoused or opposed. Such words as "dole," "gold standard," and "inflation" provoke violent emotional reactions in people who have little conception of the real meanings of these terms or the social

effects that might follow their incorporation in political practice. Consider "inflation." The word is a bogey and "the very people who would gain most by it have been taught to fear it."¹ The vested interests, who tend to be in charge of the government by virtue of their opulence, are, in general, the losers by "inflation" and, therefore, they induce the gullible masses to believe that "inflation" is bad for everybody by playing upon their fears. Arguments are offered that if we inflate, we must inevitably carry it too far; and these arguments are supported by citing what happened in this country after the Civil War and in Germany after the World War, both analogies being fallacious. Reginald McKenna, head of the largest bank in England, pointed out the unfairness of the latter analogy when he made the following comment: "I confess the thought of inflation does not alarm me. I attribute such fear of inflation, as is being expressed, to the German post-war experience, but the present situation bears no analogy, for the German inflation came on top of a previous war inflation."² It is a trick of politicians to invent bugaboos and then to demolish them for the entertainment of the populace. "Inflation" is one of the bogies. The average citizen does not know whether it is proposed to inflate his currency, his credit, or his ego. All he knows is that he wants a stable currency, but he is opposed to any measure for stabilizing it. The term "inflation" is enough to condemn any proposal regardless of its merits. Clear thinking on economic issues, or on any other issues, is rare because the average voter is so easily baited by slogans to cheer for the policies of the party in power, even though he cuts his own throat in doing so.

Education can do something toward the encouragement of straight thinking. The appreciation of the importance

¹Gilbert Seldes: *The Years of the Locust*, p. 145. 1933.

²The Boston *Herald*, February 7, 1933.

of correct reasoning is one step in the right direction. "For a great many people to believe the earth to be flat would do no particular social damage, but for a great many people to believe that waste is good for trade, machinery bad for labor, that the foreigner can and should send us plenty of money but no goods, are ideas (all but universal in Europe) which cause immeasurable misery and suffering."¹

The educational procedure must be considerably revamped if the training of students in ratiocination is to be effectively conducted. There must be less emphasis on facts, more on their interpretation and evaluation. Critical understanding must be inculcated through the practice of the scientific spirit in which curiosity is kept alive and a sense of evidence is instilled. Discrimination must be encouraged in the accepting of authorities. The student must be warned that the teacher's say-so is not the final word and that the textbook is not infallible. The examination system has been developed in such a way as to place a premium upon memorizing, in order to facilitate the mechanical process of marking. Thus the pupil is asked: Is this so? not, what do you think of it? History, to take an example, should be studied through a variety of sources. There should be several textbooks written from different points of view. A course in American History should include a study of the Revolution by an Englishman.²

The educational method of encouraging critical study may be appropriately illustrated by indicating two weaknesses to which scientific psychology is liable. The thinking student will keep in mind, in evaluating modern experimental psychology, the dangers of oversimplification and artificiality.

¹Norman Angell: *The Public Mind*, p. 209. 1928.

²H. A. Overstreet: *Influencing Human Behavior*, Chap. 11, "The Problem of Straight Thinking." 1925.

Too often in our day the scientist solves the mysteries of life by ignoring them or by simplifying nature until it becomes comprehensible. Science, says Knight Dunlap, always prefers the simplest hypotheses.¹ The lure of simplicity has distorted the perspective of scientists, in many cases, so that they can no longer see the complications which are staring right at them in the phenomena under observation.² It is the habit of science to thrust in the background that which it is unable to measure and understand, which is the same as saying that it is the habit of science to be unscientific. The cocksureness of the scientist, in psychological terms, is a compensation for his own underlying uncertainties.

The urge for simplification has seduced psychology into errors. The law of parsimony (economy of hypothesis) has been stated for psychology in Morgan's Canon: "In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale."³ In practice the simplest adequate interpretation has given way to the simplest interpretation whether it is adequate or not.

Morgan, in laying down his principle of economy, intended it chiefly as a warning against the anthropomorphic interpretation of animal behavior. Anthropomorphism means that the human being explains animal behavior in terms of human experience, converting the animal into a human being for purposes of description. The dog lover who reads his own feelings into canine experience illustrates the anthropomorphic tendency. "See, Rover is dejected, he feels sorry for what he did—his conscience is bothering him." Montaigne described the cogitations of

¹Knight Dunlap: *Freudianism, Mysticism, and Scientific Psychology*. 1920.

²Joseph Jastrow in *Feeling and Emotions*, pp. 436-437. 1928.

³C. Lloyd Morgan: *An Introduction to Comparative Psychology*, p. 53. 1903.

a fox who speculated as to whether he would cross a river where the ice was thin. After hearing the running water, the fox indulged in the following logic: "Whatsoever maketh a noise moveth, whatsoever moveth is not frozen, whatsoever is not frozen is liquid, whatsoever is liquid yields under any weight." In reacting against this sort of anthropomorphism, psychologists have gone to the other extreme, becoming obsessed with an undue feeling of caution. When a German police dog responded to such verbal instructions as "jump over the sofa"—or "go into the back room," a psychologist commented thus on the abilities of the dog: "Animals may obey commands as sounds rather than words. Personally we are of the opinion that the dog has learned to associate certain sounds, rather than words in the human sense, with the proper objects and commands." When he was asked whether he thought the dog could think, he continued: "I wouldn't say that. We can't say that people do."

The same urge for simplicity has carried over into the interpretation of human behavior. Since consciousness baffles the psychologist, there is no consciousness—man is just a machine. Such an attitude is a betrayal of science, for the scientific method demands the recognition of *all* the discoverable facts pertinent to any problem. Herrick writes: "Our subjective experiences are very real to us, and before throwing them into the discard we may well inquire in an unprejudiced attitude whether they are not genuine factors in a rigidly scientific study of man. . . . We must . . . recognize conscious acts, that is, processes which we know best introspectively, as by far the most important agencies of control of human behavior."¹

In addition to the error of oversimplification, psychology

¹C. J. Herrick: *Fatalism or Freedom*, pp. 46-47. 1926. Reprinted by permission of W. W. Norton & Co.

has trespassed on fact in claiming too much for the experimental method.¹ In fleeing the armchair psychology of medieval philosophers, psychologists have relied upon experiment to win scientific recognition. We must note, however, that only a limited range of experience can be submitted to the conditions of laboratory testing. It is one thing to study animals or human beings under the natural conditions of everyday life, and another to observe them under experimental controls in the laboratory. "When we used to experiment upon the emotions in the psychological laboratory, we had all the equipment for it except the emotions."² Laboratory psychology often runs the risk of being artificial. It is difficult to set up the conditions in an experiment so accurately that they duplicate exactly the natural situation, and because of this difficulty it is not safe to predict from one's behavior under one set of conditions just what one will do under another. A psychologist studied religious emotions by playing hymns on an organ in a laboratory and asking his listeners to report on their feelings under the sway of the music. People do not experience religion under such conditions.

VI. OUR NEW WAYS OF THINKING

The Aristotelian logic was the prevalent mode of thinking until very recent times. The shift to new modes of thought is fundamentally due to the development of statistics. The change is from an absolute, final truth to a changing, growing probability. The difference between the two logics rests fundamentally upon the difference between an Aristotelian "class" and a statistical "group." "All soldiers are brave," meant, for the Aristotelian logic,

¹See H. Prinzhorn: "The Value and Limits of the Experimental Method in Psychology," *Character and Personality*, 1933, 1, 251-258.

²E. R. Wembridge: "Emotion in the Courtroom," *American Mercury*, 1929, 17, 48-53.

that there is a quality, "bravery," which appears incarnate in each and every soldier, if the statement is true. In so far as soldiers are members of the class of heroes, they are all alike. It also followed that there is a quality called "not-bravery," or "cowardice," which no soldiers have. "All soldiers are brave" would mean in statistical logic that if you arranged each and every soldier in order of bravery, assuming that bravery is something measurable, you would find a few who were always brave and a few who were never brave. You would find that in between the extremes of these two contrasting groups was an overwhelming mass of individuals whose differences were less and less noticeable, the so-called "average" doughboys, who neither courted danger nor shunned it. "All soldiers are brave," then, would mean not that absolutely each and every soldier is brave and to the same degree brave, but that on the whole soldiers are brave.

The Greek believed that all animals fall into fixed and permanent groups called "species." Within any group the individuals are all alike. When the group's characteristics are known, the characteristics of the individuals are automatically known. One had only to classify and all was done, for once an object was classified its nature was known. What was done with exceptions? They were either called "accidental" if they were slight, or "monstrous" if they were great. Individuals may range from the idiot to Einstein. Einstein, if his reputation is justified, is just as monstrous at one end of the scale as the poor cretin at the other. He varies almost as far from the median. He varies, however, in a good direction. There is no feeling that his variation is something either diabolical or divine. It is to be expected.

Justice used to be conceived as blindfolded. No longer is this so. *Justice* treats no two individuals alike, for it weighs not the criminal but the peculiar conditions which

brought him forth. Moral standards must be refashioned and made relative to individual needs and capacities. Standards represent the "normal" only in the sense of a statistical "average." So long as humanity *on the whole* acts in a given way, society will have its standards.

Statistical records tell us only about group tendencies. They do not justify an interpretation of the probable conduct of any specific individual. An observer watches a vast throng pushing through an amusement district. By the law of averages he knows that a certain proportion will attend one theater, other proportions other theaters. But he cannot tell which person will enter any particular theater. Many of the people themselves could not enlighten him. The prediction of group tendencies is very useful. The plotting of fashion changes, for example, is helpful to the manufacturer who contemplates the introduction of a new style. Some specific person cannot be counted upon as a prospective customer, but the consuming public, in general, can be relied upon, with a fair degree of probability, to fall in line.

Statistical studies enable us to predict human behavior in general in terms of probability. There is a law of averages based, not on chance, but on cause and effect. The majority of people who commit suicide do so on bright days, since a discouraged person, on a gloomy day, thinks he will feel better when the sun comes out, but when the sun is out and his outlook still seems hopeless, he sees nothing to wait for. In a large city a man is more likely to meet and marry a girl who lives across the street than he is to discover and marry an equally desirable girl who lives near him on the same side of the street, since the chances are more favorable for his noticing a girl who comes and goes from a front door opposite his own. A chain of cigar stores can estimate, by counting pedestrians passing in front of a proposed location, just how many

men will come in to buy, and a mail-order house can determine the average value of a day's orders simply by weighing the mail. Telephone companies know that the peak of telephone calls in a residential section for the whole day will be around eight-thirty in the morning since the man of the house has left home by that time, giving his wife a chance to sit down and phone for the groceries or chat with friends. By statistical evidence, a woman of 40 who has never been married has only *half* the marriage probability she had at 35; but a widow's chances at 40 are practically as good as they were at 35. The widow, having had as a wife more experience than her unmarried competitors, knows how to make herself agreeable to men.¹

Science must take account not only of uniformity but also of variation. Whereas variation was shocking in Greece and had to be explained away, uniformity is shocking today and equally suspect. The newer procedure is to get a wide selection of samples, to analyze the differences and likenesses, to draw conclusions which are to be recognized as mere approximations. Facts are only probabilities. All measurement involves three independent variables:

1. The thing to be measured
2. The measuring instrument
3. The observer.

A number of readings are taken and the average computed. The average is then called *the* reading. Measurements are approximations, and, therefore, should not be venerated as absolute.

Definitions are arbitrary, convenient; not true, or false. The Aristotelian will criticize a book by saying that it is a good book, but that it is not a novel. What of it? What

¹F. C. Kelly: "How Will We Behave?" Copyright, October, 1935, by Esquire-Coronet, Inc.

is a novel? Your answer will be neither true nor false, but merely a matter of convenience.

Thus the newer logic is introducing a different way of looking at things. Modes of thought have changed. Attitudes have altered. A new spirit has been engendered which is tolerant of the exceptional, which appreciates the relative nature of judgments, which has turned from absolutes to probability.¹

SUMMARY

Thinking depends upon the suspension of action. It is essentially the appreciation of relationships, "putting two and two together." The process may or may not involve imagery.

The goal of thinking is a belief which may issue in action. It is important that the belief be sound since erroneous conclusions are often disastrous in their consequences. The rules of logic should be adhered to in order to insure correct thinking.

Induction is the gathering of evidence to establish a rule that will accord with the facts. Deduction is the application of that rule to a particular case. Both processes are subject to error, as are also the arguments by analogy and by cause-and-effect.

Education should establish the habit of scientific thinking by encouraging critical judgment and respect for the importance of controlling conditions. Some psychologists are prone to commit the errors of oversimplification and artificiality.

Statistical studies enable us to predict group tendencies with considerable accuracy. The Aristotelian logic is being replaced by new modes of thinking because of the influence of statistical methods for organizing data.

¹George Boas: *Our New Ways of Thinking*. 1930.

INTELLIGENT ADJUSTMENT

BY THE MAJORITY of people physical prowess is esteemed more highly than preëminent intelligence. Brawn carries more prestige than brains. The athlete is glorified while the intellectual is lost in the shuffle. By the bestowal of its admiration society creates its own heroes—football stars, prize fighters, home-run kings, and marathon dancers. It is obvious to the thoughtful observer that athletes do not make contributions to the advancement of civilization commensurate with the applause awarded them. A chimpanzee is three or four times as strong as the huskiest athlete. It is folly, therefore, for man to covet brute strength when his special gift lies in the supremacy of mind.

I. THE IMPORTANCE OF INTELLIGENCE

One of the fundamental tenets of the American faith is the belief that industry and thrift are the sole prerequisites of success. "Never forget that all the recipe any man needs to make a million dollars is hard work." Such a doctrine, stated dogmatically, is, of course, sheer nonsense. There are probably many people who work hard and who fail to achieve any perceptible results, simply because they lack the intelligence to direct their efforts in the most fruitful channels. The small farmer who toils from dawn till darkness with outmoded tools is more cursed with fatigue than wealth; the husband who putters around the

house when he should be improving himself for advancement in the office is penny wise and pound foolish. Hard work has its place but many people would not have to labor so strenuously if they were blessed with more intelligence, or if they made use of the intelligence available to them.

One of the most vital problems of society is to discover persons of high intelligence, and to evolve political means of securing their rise to office, for the price of stupidity is multiplied beyond computation when dullness is enthroned in high places.¹ If psychology can determine the nature of intelligence and then develop procedures for testing it, a long step will be taken toward capitalizing the human resources at our disposal. We need men of the highest mental caliber not only in political office, but also in all positions of leadership—in banking, industry, law, medicine, teaching, and the ministry. Not all of the hopes which were centered upon the fruitfulness of intelligence testing have as yet been realized, but progress has been made in improving its usefulness. Too much was expected in the enthusiasm of first discovery; experience has given us the wisdom to evaluate the import of intelligence in a larger perspective. The findings of psychological research into the problems of intelligence have proven their value.

II. WHAT IS INTELLIGENCE?

Intelligence is not a thing, but it is a term used to describe the degree of efficiency with which the organism succeeds in adjusting itself to the environment. On the physiological level, it must be recognized that bodily processes function intelligently without any conscious direction, that is, they function in such a way as to pro-

¹See W. B. Pitkin: *A Short Introduction to the History of Human Stupidity*, pp. 112-115. 1932.

mote the most effective adjustment of the organism to the environmental demands, whether it be the mending of a broken bone, the repair of an injured nerve fiber, or the healing of an open wound.¹ Living matter is characterized by a capacity for adapting itself to changing conditions in ways conducive to its self-preservation.

On the psychological level, intelligence refers to the success achieved by the individual in consciously organizing his attitudes and capacities to meet the various problems involved in living. In the interest of accuracy, it might be wise to avoid the use of the noun "intelligence," and to substitute the adverb "intelligently" whenever the term is called for. Thus it would be proper to say that Jones behaves intelligently, not that Jones has intelligence; that is, Jones does the right thing at the right time. If the top of his toothpaste tube, for example, is fumbled over the washbowl, Jones does not chase the top all over the bowl but places his hand over the drain to prevent the elusive object from escaping through the outlet. In other words, Jones handles the problem with a high degree of effectiveness. If Jones does as well in most situations, he conducts himself intelligently. How is Jones' efficiency to be explained? The simple answer is that he has intelligence, and there the analysis stops because a word has solved the whole puzzle, whether or not there exists something to correspond to the verbal designation. The more exact answer is that Jones' mind functions in such a way as to secure the maximum of efficiency, because certain definite capacities are successfully integrated. The answer is incomplete. It is merely a challenge to investigate further. What is there about Jones' mind which makes it possible for him to act more intelligently than someone else? The problem is very complex; the solution, therefore, will be very complicated.

¹See W. B. Cannon: *The Wisdom of the Body*. 1932.

An analysis of intelligence shows that the term ordinarily involves:

An inborn capacity to learn
A capacity for abstract thinking
Mental alertness
Sound judgment
Emotional balance
General adaptability.¹

We shall examine these factors in order.

A. An Inborn Capacity to Learn. The physical basis of intelligence, according to one theory, is the number of nervous connections made possible by original nature.²

Since intelligence depends upon the physical structure of the brain that is inherited, it seems fitting to assume, as many psychologists do, that intelligence consists of a native capacity to assimilate and to profit by experience. One bit of evidence in favor of the view that intelligence is native is the approximate constancy in the growth of ability with respect to increasing age. A bright child, generally speaking, becomes a bright adult; a dull child, a dull adult. Another bit of evidence is the transmission of intelligence through heredity. One famous study is a survey of the descendants of Martin Kallikak. During the Revolutionary War, Kallikak met a feeble-minded girl by whom he became the father of a feeble-minded son. In 1912 there were 480 known direct descendants of this temporary union, 143 of them known to be feeble-minded, many of them of illegitimate birth, and many of them alcoholics or prostitutes. Returning from the War this same Martin Kallikak married a respectable girl of good

¹Thurstone has analyzed mental endowment into seven primary abilities: (1) number facility, (2) word fluency, (3) visualizing, (4) memory, (5) perceptual speed, (6) induction, (7) verbal reasoning. See L. L. Thurstone: "A New Conception of Intelligence," *Educational Record*, 1936, 17, 441-450.

²See E. L. Thorndike, et al.: *The Measurement of Intelligence*. 1926.

family. Among the 496 individuals in direct descent there are no feeble-minded persons, no illegitimate children, no prostitutes, no criminals; they are, for the most part, distinguished persons, including doctors, lawyers, judges, educators, traders, and landholders.¹ The conclusions drawn from this study, however, must be discounted in the light of some considerable doubt as to how valid it was for a social worker in 1911 to pronounce as feeble-minded the tavern girl of Kallikak's first mating, way back in the period of the American Revolution.² It should also be pointed out that the environmental factor was not kept constant as a control in the investigation.

In spite of those psychologists who define intelligence in terms of native capacity, there is evidence to support the view that environment plays an important role in the determination of intelligence. Sherman and Henry made a study of five communities in the Virginia mountain region, of varying levels of culture, in which they considered the relation of intelligence to the cultural background. The communities studied were four hollows located approximately one hundred miles west of Washington, D. C., in the Blue Ridge Mountains, and a small village at the base of the Blue Ridge about the same distance from Washington to the southwest. All the children were of the same ancestral stock. Intelligence tests were given to more than half of the children of the five communities. The results of the intelligence tests of mountain children living in varying degrees of isolation appear to confirm the belief that the expression of intelligence as measured by standardized tests depends upon the opportunities to gather information, and upon the requirements

¹H. H. Goddard: *The Kallikak Family*. 1914.

²For a criticism of the Kallikak and similar studies, see Albert Deutsch: *The Mentally Ill in America*, Chap. 17, "Changing Concepts in Mental Defect." 1937.

made upon the individual by his environment. The young children of the various Hollows do not differ greatly in intelligence, whereas great differences are found between the older children of the different Hollows. The only plausible explanation of the increasing difference with increasing age is that children develop only as the environment stimulates development. The intelligence of the children is found to be highest in the communities highest in the scale of social development, and to be lowest in the communities of lowest social development.¹

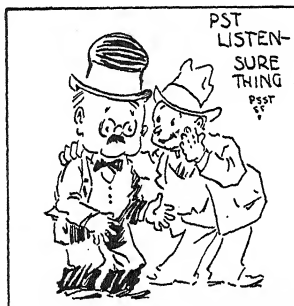
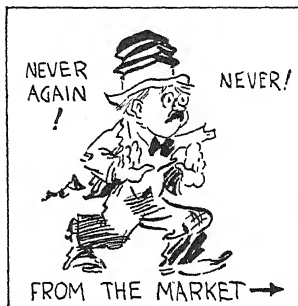
Assuming that intelligence is a native capacity for learning, psychologists have been interested in ascertaining indirectly, by tests, what a person can learn rather than what he has learned. The aim of the tests is to discover inborn capacity as distinct from acquired knowledge. What a person has learned is some index, of course, as to what he can learn. But it would be unfair to measure native capacity in terms of knowledge, because people differ so widely in the sorts of environments to which they are exposed, and because these differences are dependent to such an extent upon the vicissitudes of life that experimental control is out of the question. The psychologist, therefore, aims to present situations with which all testees have had opportunities to become familiar in order to discover the native learning capacity for various sorts of material. Whether it is possible to eliminate the factor of experience is certainly debatable. At any rate, the psychologist seeks to reduce this factor to a minimum.

The intelligent person learns from experience. He profits by his mistakes. The person who behaves intelligently learns, among other things, to control his desires in the light of the consequences which he foresees as evolving from his present actions.

Learning is only one aspect of the remembering process,

¹See M. Sherman and T. R. Henry: *Hollow Folk*. 1933.

and the remembering process is only one of many mental processes. Learning, therefore, taken by itself, does not exhaust intelligence. Binet once said: "Memory is a great simulator of intelligence. It is a wise teacher who is not deceived by it." The educational program is so arranged



THE GREAT LESSON

Illustrating how little some people learn from experience.

(Drawn by Charlotte Boyer with apologies to Herb Block.)

as to place undue stress on memorizing, so that the high-ranking student is often the "grind" who mechanically learns by heart the material to be covered in the examinations, but who is suspected of not deserving the label "intelligent" by his less conscientious classmates. Nevertheless, there is a high positive correlation between memory and intelligence, for which there is a psychological

basis in the fact that memory capacity involves mental organization to a high degree.¹

An inborn capacity to learn, however it manifests itself, is one of the factors involved in intelligent behavior.

B. A Capacity for Abstract Thinking. Another characteristic of the intelligent person is his ability to think abstractly. It is common to consider a philosopher as being more intelligent than a mechanic, no matter how expert the mechanic is in his own line. "An individual is intelligent in proportion as he is able to carry on abstract thinking."² The abstract thinker deals with concepts rather than concrete objects. He reasons well because he can grasp relations, because he can plan ahead, because he can organize what he has learned, and can apply his knowledge effectively. If two men possess equally rich stores of knowledge, the more sagacious one will be more gifted in selecting from the facts at his finger tips those facts that are relevant to the particular problem at hand. Suppose these two men are lawyers. They both are well versed in law. The more intelligent one of the two is the one who can select from all the cases of which he is cognizant only those specific cases which are immediately applicable to the situation of his client; he not only knows the precedents, but he also appreciates their full significance in their bearing upon the legal problem which he is attacking. The factor which constitutes his superior intelligence is his ability to generalize or, to use a phrase from Francis Bacon, it is his ability to recognize similitudes. It is this same capacity which underlies the inventiveness of the constructive imagination, the knack for combining facts in new ways so as to improve upon the

¹H. P. Haiti: "Memory and Intelligence," *Indian Journal of Psychology*, 1931, 6, 169-181.

²L. M. Terman: "Intelligence and Its Measurement: A Symposium," *Journal of Educational Psychology*, 1921, 12, 127-136.

old. Take, for example, the brilliant medical discovery of Auenbrugger. He was the son of an innkeeper, and in his boyhood it was his chore to look after the wine casks. He learned to estimate the amount of wine in the kegs by tapping them on top: if the resounding note was low, it meant that the wine was nearly gone; if the note was high, it meant that the wine was still plentiful. Later in life Auenbrugger became a doctor. One of his patients died. The autopsy revealed a chest full of fluid—pus. The problem flashed into Auenbrugger's mind: How could a doctor discover fluid in the chest while the patient was still alive? In groping for an answer to that query, his mind went back to his boyhood, to the days when he tended the wine casks. The connection dawned on him. The chest with fluid in it was much like a wine cask. It had a rigid opaque wall; there was air above and fluid below. He took patients and began tapping their chests. The procedure worked perfectly. He could find fluid, and he could also find the solidifications of tuberculosis and pneumonia. Auenbrugger applied his experience because he was intelligent enough to appreciate a relationship between two problems, and to draw a generalization which linked the solutions. He recognized a similarity which would have escaped the notice of a less intelligent person. The ability to put two and two together constituted one aspect of Auenbrugger's intelligence. Therein lay his inventiveness.

C. Mental Alertness. Mental alertness is another factor in the makeup of intelligence. A person who is intelligent is quick in his reactions; he "catches on" rapidly when complicated instructions are given him, whether in reference to a laboratory task or a game he has never played before. Most intelligence tests are planned to put some premium on speed, for a person who can work fast and accurately in solving test problems is considered more

intelligent than another person who gets the right answers but does so slowly.

The intelligent person takes an interest in events. He keeps himself well informed because he feels a zest for life and an eagerness to participate in the solution of its manifold problems. The intelligent player in a game of contract bridge plays the game in a "heads-up" fashion, that is, watches the cards carefully as they fall, so that he will not nonchalantly play the wrong card. Some people are bright enough to play bridge well, yet they do not enjoy the game enough to pay attention. They are stupid bridge players simply because they are not alert in that particular situation. Intelligence must be judged by performance, not by potentiality. If an individual absent-mindedly boards the wrong train, his behavior is stupid, no matter how bountifully he may be blessed with brains. To take full advantage of his capacities, the human being must concentrate on the present problem. He must be alert every moment. He must "keep his wits about him."

Some people remain in blissful ignorance of the world about them. College students often manifest an inordinate lack of curiosity. When a class is asked who discovered insulin, it is rare to find more than one or two in the group who know, in spite of the fact that the men responsible for this contribution to medical progress are outstanding benefactors of humanity. It is even more enlightening to repeat the question a week later and to learn that the same state of ignorance still prevails, none of the class showing enough interest to investigate the problem. They do not care.

Insensitiveness to the environment is due, in some cases, to defective sense organs. Many people have eyes defective enough to render reading distasteful to them, so that they grow up ill-informed. Pitkin found that many businessmen give up virtually all cultural reading because

their eyes are tired by the time they have covered the assignments of the daily grind at the office. They make no pretense of keeping abreast of the times, even by a thorough perusal of the newspapers. Thus they gradually dull their sensitivities to world trends and human relations.¹

What has been said of the eyes is equally applicable to the ears, though the eyes are probably the more important sense as far as the intellectual life is concerned. Sensory incapacities combine with deficient powers of attention to render observation ineffective. Since intelligent action depends to a large degree upon accurate observation, insensitivity contributes its part to the promotion of incompetence. Mental alertness, whether conceived in terms of efficient sense organs or in terms of a wide-awake intellect, must be considered as one factor in the total structure of intelligence.

D. Sound Judgment. The intelligent direction of conduct demands something that transcends mere knowledge, something that cannot be gained from books or lectures, something which we usually designate as wisdom. The idea is well expressed by a friend of mine who is a farmer and who has not had a higher education: "I'd rather have common sense than brains." People who are blessed with wisdom are found in all walks of life. They always seem to know just what the situation calls for. They do not blunder at the critical moment and then discover afterward what they should have done. They execute the correct response without the necessity for long cogitation. The passage of time only serves to confirm them in the confidence which dictated the initial decision. Even when they have time to think things over, they arrive at the conclusion which exactly fits the solution of the problem. They comprehend the human equation in its relation to

¹Pitkin, *op. cit.*, pp. 138-140.

the events with which they are dealing. Their judgments are sound, which is equivalent to stating that their adjustments are intelligently planned and executed.

The popular mind draws the distinction between knowledge and wisdom in its suspicion of "book larnin'." The average citizen looks upon the professor as a theorist who inevitably becomes a bungler when it comes to the hard facts of the workaday world. A good example is found in the popular reaction to the brain trust organized by President Roosevelt. Many businessmen feel that the professors should confine themselves to the classroom where their ideas may remain harmless. These people feel that the theories furnish interesting material for speculation, but that they do not work in practice. It is not surprising, therefore, that the entrance of the professoriate into politics is regarded, in many quarters, with considerable alarm. Professors may know a lot, so the opinion runs, but they are not wise in the affairs of men.

Wisdom is, to some degree, the product of experience, though it is not everyone who becomes wiser through experience. Sanity and balance are achieved only by those persons who are able to appreciate the significance of events, who are ready to weigh issues with a sense of proportion, and who are prepared to relate every happening to their perspective of the whole. It is not so much the experience a person has that counts—it is what he does with it. Intelligent living results when there is a happy combination of knowledge with the ability to apply that knowledge effectively to ends which are judiciously chosen.

E. Emotional Balance. Poise is necessary if ability is to function to the best advantage. Students frequently insist that they know more than they have shown on the examination, and that their poor exhibitions are due to the fact that they go all to pieces under the stress of a test. Some individuals become so unnerved by the realization

that they are taking an intelligence test that they cannot do justice to themselves. The answer to such excuses is that one factor in intelligence is the ability to keep cool under trial. Success in life often depends upon the knack of doing well when shining really counts: appearing at one's best in an interview or making a convincing speech in a critical situation. Capacity is of no avail if it fails to function when it is most needed. A quarterback who scintillates in practice, but who chooses the wrong plays in the crucial game, is not a great football player. The student who allows an examination to "rattle" him is not a success, in so far as the educational system measures success by its clumsy methods of testing, and in so far as progress in life, too, is determined by clumsy judgments based on periodic trials of the individual's mettle. Courage is requisite to the full capitalization of ability, and as such must be considered a factor in intelligence. Poise is sometimes as important as knowledge for passing the tests we all have to pass in our competitive existence.

The feeling that a problem cannot be solved may prevent a person from applying his intelligence to its solution. Dr. Louis Herrmann was interested in perfecting a machine for treating people whose legs were dying because of defective arteries. Many of these patients had been advised by doctors to have their limbs amputated to prevent gangrene. Herrmann wanted to avoid the necessity of such an operation, if possible, by improving the circulation with a mechanical device.

He asked a big electrical company about making a machine that would automatically build just the right vacuum and pressure in a box. Being experts, they said it couldn't be done. So Herrmann and Edward McGrath [a physician who came to his help] forgot [that] they were only doctors. They prowled around electrical supply places, radio stores, and junk shops, and produced a machine that was crude but foolproof. With

faultless precision it switched the pressure of air around sick feet, four times a minute. Proudly Herrmann named his treatment *Pavaex*, because it gave dying legs *passive vascular exercises*. The machine worked, and many patients were treated successfully.¹

Freedom from prejudice is likewise significant for intelligent behavior since the biased mind may fail to make the best use of the mental resources at hand. An individual may commit a serious blunder because he has closed his mind to certain facts that must be recognized if the situation is to be effectively met. A prejudiced opinion is seldom intelligent. Prepossessions may thwart even the best minds by blinding them to the most obvious facts. Effective adjustment must be based on a knowledge of the truth rather than on sentimental notions. Strong prejudice may impede the application of intelligence so seriously as to render it useless, and even harmful, for the consistent pursuit of folly is a definite insurance of disaster.

The importance of emotional balance is well illustrated in habits of stubbornness. The term "habits" is used purposely because stubbornness is not a general trait but a specific habit. A person is stubborn only in certain situations; at other times, he is just persistent. When a man tries to put on a tire chain that is too short, and pulls on it peevishly instead of surveying the situation and pausing to insert an extra link, his stupidity is largely the product of his obstinacy. The man who stays in a rut all his life is often honored by a banquet for his faithful service, though, if the truth be known, his long record is merely a monument to his unintelligent doggedness. Traditions of perseverance and stick-to-it-iveness often make it difficult to quit a given line of endeavor, even

¹Paul de Kruif: "New Feet for Old," *Country Gentleman*, December, 1934. Reprinted by permission of Harcourt, Brace & Company, Inc.

though the odds are overwhelmingly against further plodding. The fear of being called a quitter or "a rolling stone" keeps a person from doing the intelligent thing, giving up what he is trying to do, and attempting something else for which he may be better fitted.

Thus it becomes obvious that intelligent progress in life depends to a considerable extent upon the development of emotional habits which promote the use of ability to the utmost advantage.

F. General Adaptability. The final factor in our analysis of intelligence is general adaptability. Intelligence is a matter of modifiability and variability. The intelligent person learns from experience to meet a wide variety of situations adequately. He can deal with novel situations successfully. He can do a variety of things and do them all well. In such a category belongs Albert Schweitzer whose manifold accomplishments in theology, music, and medicine recall the many-sided genius of Leonardo da Vinci.¹ The breadth of his mind constitutes his versatility.

The intelligent individual excels in the catholicity of his talents, feeling at home in the classroom, on the athletic field, or in the drawing room. If a person is intelligent, he will not only do well in one sort of activity, but he will also do well in other sorts of activity, because he possesses some general ability that is applicable to various kinds of tasks. This general intelligence accounts for the positive correlation among the different intellectual traits of the individual.

Educational policy in universities dedicated to the pursuit of the liberal arts has been based on the conviction that the training of general intelligence through cultural studies is the most adequate method of preparing the student for any vocation. Flexner suggests that univer-

¹See Albert Schweitzer: *Out of My Life and Thought: An Autobiography*. 1933.

sities should not train a man for a specific trade, but should train his intelligence, which then can be applied to any field of endeavor. It is not the business of universities to introduce the student to all future and possible details, but to train him in fundamentals so that he can later solve his own problems.

Education—college education, liberal education, call it what you will—should, one might suppose, concern itself primarily during adolescence and early manhood and womanhood with the liberation, organization, and direction of power and intelligence, with the development of taste, with culture . . . on the assumption that a trained mind, stored with knowledge, will readily enough find itself even in our complex world.¹

Flexner Thus Flexner advocates formal discipline: train the mind culturally, and the reward will be a perfected instrument applicable to any vocation, whether it be insurance, selling bonds, or the practice of law.

Thus speak the proponents of the view that there is a general intelligence.

Opposing such a view are those psychologists who stress specificity, the specificity of habit or the specificity of ability, and who insist that there is no intelligence, but that, instead, there are intelligences. Evidence of specificity is familiar to the observant person.

Authors frequently go on the lecture platform and draw large audiences because people assume that if a man can write well he can also speak well. Their expectations, however, often prove ill founded, for writing and speaking seem to be distinct abilities.

The scholar is often gifted with abstract intelligence, though lacking concrete intelligence, that is, the mechanical ability for handling things with agility and skill, whether it be a football or a sparkplug.

¹Abraham Flexner: *Universities: American, English, and German*, pp. 53, 63. 1930.

The scholar is likewise apt to be lacking in social intelligence, in that he encounters great difficulty in adapting himself to people and in understanding the ways of the world. The intellectual seldom becomes renowned as a social lion. It is exceptional, as William James pointed out, for the philosopher and the lady-killer to inhabit the same tenement of clay. The bright person is often "hard to get along with" because he cannot understand why everybody else is so stupid. The lack of social intelligence frequently renders the professor an easy mark for swindlers. The itch to get something for nothing may plunge the bright and dull alike into folly.

The fact that a man has ability in one field of activity is no guarantee that he is just as capable in other lines of endeavor. It may be misleading, therefore, to call a person intelligent, since it may result in saying, absurdly, that an intelligent individual does stupid things. In the interest of accuracy, therefore, it is advisable to reserve the term "intelligent" for a description of specific behavior in specific situations. Sometimes the individual behaves intelligently; sometimes, stupidly. He may lead his class in mathematics and trail his class in Latin.

Special abilities which are encountered commonly are the linguistic, the mathematical, the artistic, the musical, and the mechanical. It is an everyday observation that a person may excel in one of these skills and be deficient in the rest.

Vocational guidance, which consists in finding the right man for the right job, tends to favor the view that mentality is a group of distinct abilities. If ability were so general that anybody could succeed in any occupation equally well, there would be no call for vocational guidance. There is an inclination, therefore, among those who are engaged in giving counsel on such matters to stress the specificity of ability, and, accordingly, to examine the

Genius

client with a view toward discovering a special talent for some definite occupation. Johnson O'Connor, a leader in vocational guidance, asserts that intelligence is not an indivisible entity such as adaptability, but a combination of distinct mental functions. "Abilities," he says, "are not cosmopolitan, intelligence not general; genius is confined to specific crafts and arts."¹ In advocating human engineering, he states, "The world must learn not only that each occupation has its individual requirements, but that every human being has his specialized function."² Certain deficiencies may definitely disqualify a person from some pursuits, though constituting no handicap at all for others. Manual awkwardness, for example, is detrimental to a pianist, surgeon, or instrument assembler, but not to a lawyer.

It is difficult to realize, says O'Connor, how distinct abilities are from each other. He has devised certain tests for the diagnosis of ability. Among them is a test of assembling pins, in which the task is to pick up pins from a tray and insert them into holes; another involves the checking of numbers; still another calls for the solution of a jig-saw puzzle in three dimensions, the assembling of a wiggly block. The ability to assemble pins and the ability to check numbers are independent of one another and scatter among men according to laws of chance, and the same statement holds for the relation of the wiggly block to the other two tests. "Capacity to check numbers is independent of ability to assemble the blocks; the two are separate brain functions, never reached by the same training. . . . Aptitude for the one and the other are . . . completely independent. . . . The cause of excellence in number checking differed from that which

¹Johnson O'Connor: *Born That Way*, p. 112. 1928.

²Johnson O'Connor: "A Study of Human Nature," *The Atlantic Monthly*, 1932, 150, 722-732.

gave power to analyze concrete structure."¹ The positive correlation that some psychologists find in respect to their various tests O'Connor attributes to the fact that their tests are fundamentally similar in that they are all of the paper and pencil variety. O'Connor believes that his tests are more accurate and in the light of the results he has obtained from giving his battery of tests he concludes, "Anything enabling its possessor to grade well in all tests might reasonably be called general intelligence. But no such condition appears."²

Bingham points out that there are usually wide inequalities among an individual's various talents. If the range of differences is relatively small, this individual may be as well qualified for one occupation as another, as long as the job comes within the level of his average capacity. As a general thing, the differences between a person's best specific capacities and his poorest are so large that they must be considered in occupational planning. There is a tendency for the different abilities of a single individual to cluster about his own average, with the exception of a few abilities that are apt to show a wider variation, particularly motor abilities, which, indeed, do not bear much relationship to each other.³ In the average person, according to Hull, the best potentialities on a scale of vocational aptitude efficiency are almost three times as good as his worst.⁴

The view that the mind includes a host of highly particularized and independent abilities, with no correlation at all between any two tests except in so far as they involve identical elements, is associated with the name of Thorndike, though he is not as insistent upon the specificity of us

¹Johnson O'Connor: *Born That Way*, pp. 87-88. 1928.

²*Ibid.*, p. 113.

³W. V. D. Bingham: *Aptitudes and Aptitude Testing*, Chap. 3, "Theory of Aptitude: How People Differ." 1937.

⁴C. L. Hull: *Aptitude Testing*, p. 48. 1928.

ability as he used to be. Other psychologists, however, are definitely committed to the position that mental abilities are unrelated. Kelley points out that certain capacities—some memory functions, for example—are independent variables, so that the score in one gives no prediction as to the probable score in another.¹ Memory for digits does not indicate memory for faces; memory for spoken numbers is no index of memory for printed numbers. There is no memory; there are only memories.

There has been a sustained controversy over the correlation of mental abilities. Many psychologists feel that too much stress has been laid on the specificity of ability. There are specific skills, no doubt, but transfer of training does occur. Evidence is too limited to assert dogmatically, as some have done, that transfer only occurs through identical elements. Certainly there is no scientific basis for the doctrine of formal discipline which has actuated our educational practice, and there is just as little scientific basis for some of the views critical of formal discipline, too. "Practice effects are found everywhere. They are the bane of laboratory psychology, which must always be watchful lest they confuse results. In some cases, there seem to be effects of practice on practice; learning itself seems to be learned."² The above statement of Dunlap's is supported by Stratton, who likewise notes the possibility of transfer, and who maintains that children trained to be neat in arithmetic are neat also in geography.³

A group of English psychologists, led by Spearman, find a positive correlation between mental abilities, which they explain by reference to a general factor underlying all kinds of mental operations, designated as "g." In any problem

¹T. L. Kelley: *Crossroads in the Mind of Man*. 1928.

²Knight Dunlap: *Habits*, pp. 112-122. 1932. By permission of Liveright Publishing Corporation.

³G. M. Stratton: "The Mind as Misrepresented to Teachers," *The Atlantic Monthly*, March, 1921.

calling for the play of intelligence, two factors operate: one factor being a specific ability, the second factor being a general ability common to all the specific functions. Sometimes "g" is described as the ability to educe relations, sometimes as a mental energy transferable from one mental operation to another. In short, "g" represents a common factor corresponding to what we have called general intelligence.¹

Whether you accept the point of view which stresses specificity or the one which emphasizes the general nature of ability, intelligence is a matter of versatility. In the former case, a person is intelligent who possesses a repertoire of numerous special abilities; in the latter case, a person is intelligent who is blessed with enough "g" to allow him to adapt himself readily to a wide variety of situations. In either case, he must be versatile. In testing practice it makes little difference in the answer whether you pool cognitive operations or average special abilities, as will become clear when we consider intelligence testing.²

G. Summary. Intelligence involves a host of factors, some of which have been mentioned, such as:

1. An inborn capacity to learn.
2. Abstract thinking.
3. Mental alertness.
4. Sound judgment.
5. Emotional balance.
6. General adaptability.

The above list is not intended to be exhaustive. It suffices, however, to indicate the complexity of the subject. Some of the factors cited are ignored by some psychologists; still others might be added by some psycholo-

¹See Charles Spearman: *The Abilities of Man*. 1927. Also: *The Nature of Intelligence and the Principles of Cognition*. 1923.

²See W. F. Dearborn: *Intelligence Tests: Their Significance for School and Society*. 1928.

gists; furthermore, psychologists differ in the weighting of the various factors, some stressing the learning capacity, some the aptitude for abstract thinking, and some the general adaptability. (In some cases, the conception of intelligence has been narrowed down to fit the limitations of testing, so that a particular test may be considered as an adequate measure of whatever the psychologist decides to call "intelligence.") It is obvious that a number of the factors we have noted are not easily subject to accurate measurement. Usually, therefore, they are passed over in favor of those factors which can be more readily measured.

In fairness to all the several aspects of the problem, it seems justifiable to state that an individual qualifies as intelligent if his mind functions effectively; that is, if he can concentrate his attention on what he is doing, if he perceives clearly the essential elements in a situation, if he learns rapidly and remembers with facility, if he can look ahead and anticipate accurately, if he can think straight and weigh his conclusions judiciously, if he can organize his mental processes around ends that are important to his welfare, or, to put it succinctly, if he can adjust himself successfully to any sort of demand imposed upon him in the course of his everyday life.

III. INTELLIGENCE TESTING

To the uninitiated it may seem that an intelligence test is any collection of questions to which the eminent psychologist giving the test happens to know the replies, but to the initiated an intelligence test represents a standardized interview carried out according to a standardized procedure, and interpreted according to norms established by long painstaking investigation.

The measurement of ability must proceed by comparing one person's ability with another's. One man is more or less intelligent than another. A preliminary step in the

formulation of a test must be the determination of a standard. The psychologist must select certain tasks which he considers as indicative of intelligence and then ascertain whether his results correlate positively with other estimates of intelligence. The procedure, in general, is to decide, at the start, who are intelligent and who are stupid, checking by means of all the available criteria, such as the teachers' estimates, school records, and similar measures; then a test is devised and administered to the individuals concerned; if the intelligent persons tend to excel in the test and the stupid persons tend to do poorly, then the test may be considered valid in proportion to the degree of positive correlation. Only by applying the test to a wide sampling of individuals under standardized conditions can the test be adequately validated. A given test differentiates the intelligent from the stupid with reference to a standard which the tester conceives to be definitive of intelligence.

Historically, the interest in testing intelligence grew out of the practical necessity of distinguishing readily the pupils in school who could be relied upon to make normal progress from those pupils who were apt to meet failure. It was natural, therefore, that the standard of intelligence should be formulated in terms of scholastic success. Those pupils who were ranked high by their teachers in their classroom work were taken as representative of intelligence, and tests which revealed their superior abilities were considered as valid measures of intelligence; comparable results for the pupils ranked as stupid by their teachers, of course, were involved in the process of validation. Thus a test was devised which served as a ready measure of aptitude for scholastic tasks, and this aptitude was called intelligence. The early tests were designed for scholastic use, and most of the tests evolved since that time have been planned with the same end in view. Con-

sequently, it is not surprising that intelligence testing has stressed those functions which count heavily in school success.

A. History. In 1904, Alfred Binet, a French psychologist, was appointed a member of a commission to formulate recommendations for the administration of the special classes for dull children in the public schools of France. The appointment afforded him an opportunity to try out some tests he and Simon had been developing. Their dominant interest was to devise some accurate means of discriminating between the normal child and the feeble-minded child. Galton's studies on the subject of individual differences had prepared the way for the development of the project undertaken by Binet.

Binet emphasized three characteristics of the thought process:

1. Its tendency to take and maintain a definite direction.
2. The capacity to make adaptations for the purpose of attaining a desired end.
3. The power of self-criticism, as involved in comparing oneself to a model to determine whether one is correct or not.¹

As Binet felt his way in this pioneer investigation, he experimented with a wide range of tests, such as time orientation, three or four kinds of memory, apperception, language comprehension, knowledge about common objects, free association, number mastery, constructive imagination, ability to compare concepts, to see contradictions, to combine fragments into a unitary whole, to comprehend abstract terms, and to meet novel situations. In 1905 a rough graded series of tests was completed, which was revised in 1908 and again in 1911. Binet proceeded on the assumption that the percentage of passes on the series of tests should increase with age and that children known on other grounds to be bright should pass more tests than

¹A. Binet: *L'Étude expérimentale de l'intelligence*. 1902.

children of the same age known on other grounds to be dull. Arranging the tests in the order of difficulty, he discovered that on the average a child of a certain age could perform successfully tasks of a certain degree of difficulty. The main problem was to determine the age level of a given test, that is, to discover at what age a "normal" child could pass a test. The easiest test was formulated for a three-year-old child; the tests for the four-year-old child were designed to be too difficult for the three-year-old child and just difficult enough for the four-year level. A test was located at that particular year level where two thirds to three quarters of unselected children of that particular age were able to perform the task successfully. Thus the norm was established for that age. The tests had to be tried out on children of different ages and made easier or more difficult to fit the age in view more exactly. Each particular test was scored as passed or failed. The raw score for the individual was the number of tests passed.

The raw score, on the average, increased with age, so that, in general, children of eight attained a higher score than children of five, and so on along the scale. Each raw score was the norm for some age, and that level was called the mental age. In the normal child mental age and chronological age were identical; in the dull child the mental age was below the chronological age; in the bright child the mental age was above the chronological age. Binet recognized that a comparison of the mental ages of two children was valid only when both had the same schooling and the same common background of experience.¹ The tests were standardized without differentiating between the sexes. Binet endeavored in his revisions to improve his scale by seeking tests that resembled school work as little as possible, since he was aiming to measure intelligence rather than knowledge. The tests were not

¹See Henry E. Garrett: *Great Experiments in Psychology*, p. 10. 1930.

intended to uncover special talent. Later investigations have shown that Binet's tests were too easy in the lower ages and too difficult in the upper range of the scale. Binet himself was engaged in revising his scale at the time of his death in 1911.¹

PART OF BINET'S 1911 SCALE

Age 3 years.

1. Points to nose, eyes, and mouth.
2. Repeats two digits.
3. Enumerates objects in a picture.
4. Gives family name.
5. Repeats a sentence of six syllables.

Age 4 years.

1. Gives his sex.
2. Names key, knife, penny.
3. Repeats three digits.
4. Compares two lines.

Age 5 years.

1. Compares two weights.
2. Copies a square.
3. Repeats a sentence of ten syllables.
4. Counts four pennies.
5. Unites the halves of a divided rectangle.

And so on for ages 6, 7, 8, 9, 10, 12, 15, and Adult.

Binet's scale was successful in weeding out the dull from the bright pupils in the French schools. The testing gave consistent results which proved significant in practice with respect to the purpose which Binet and Simon had in mind.

The news of Binet's intelligence scale soon reached America. H. H. Goddard, director of research at the Training School for the Feeble-minded at Vineland, New Jersey, learned of the progress in intelligence testing in

¹See Joseph Peterson: *Early Conceptions and Tests of Intelligence*, pp. 117-214. 1925. See also Rudolph Pintner: *Intelligence Testing: Methods and Results*. New edition, 1931.

France. He experimented with the tests and found they differentiated well between the different grades of feeble-minded children. He translated the tests into English, made the necessary adaptations, and restandardized them on American children. In the early stages of the development in America, normal children were tested only for the purpose of standardization, for the main interest lay in the detection of those persons who possessed subnormal intelligence. Goddard's introduction of intelligence testing to this country aroused a widespread interest which has steadily increased.

Binet and Simon had instituted the use of mental age in the measurement of intelligence. As testing progressed, it became obvious to a German psychologist, William Stern, that mental age was not accurate enough as an index of a person's intelligence. The information that a child's mental age was five did not shed any light on his relative brightness without some reference to his chronological age. A mental age of five in a three-year-old child signified one thing; a mental age of five in a nine-year-old child signified quite another. The vital datum, felt Stern, must relate mental age to chronological age, and so in 1912 Stern proposed that intelligence be described in terms of the ratio of mental age to chronological age. This ratio was called the *intelligence quotient*, later abbreviated to I.Q.

$$I.Q. = \frac{M.A. \text{ (mental age)}}{C.A. \text{ (chronological age)}}$$

The percentage is omitted in stating the I.Q., so that a boy of nine who has a mental age of nine is said to have an I.Q. of 100. Thus:

$$I.Q. = \frac{9}{9} = 1.00$$

Move the decimal point two places to the right:

$$I.Q. = 100.$$

Such a person is normal, that is, he has the intelligence that can be expected in an average boy of his age. While the mental age describes an individual's intelligence level at a given time, the I.Q. goes further by describing the rate of mental development. An I.Q. of 125, for example, indicates that a person's intelligence has grown 25 per cent faster than the average individual. Any person with an I.Q. over 110 may be considered superior; any person with an I.Q. below 70 may be suspected of feeble-mindedness. The I.Q. was a notable contribution to intelligence testing, since it furnished a convenient mode of summarizing the relative status of an individual's intelligence. Stern's proposal was adopted by Terman when he undertook the revision of the Binet-Simon Scale.

In 1916 Lewis M. Terman, professor of psychology at Leland Stanford University, published the Stanford Revision of the Binet-Simon Tests, known more familiarly as the Stanford-Binet, the result of long, arduous investigation. Terman was convinced that the number of tests in the Binet-Simon Scale was inadequate, that the scale should be lengthened out at both ends to get down to the lower levels and up to the higher levels of mental ability more accurately, that the tests in the upper age levels were too difficult, that some of the tests should be ranked in different order, and that the instructions for the administration of the tests were too indefinite to insure a standardized procedure. He spent six months training examiners and six months supervising them in testing. Forty new tests were tried out on a group of 1,000 school children of average social status. Finally, ninety tests were selected from the Binet-Simon material and from the new material for the revised examination.

The Stanford-Binet test included a number of tests arranged for each of these ages—3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18. The spacing of the ages is not arbitrary, but

the result of careful experiment. The age at which the person passes all the tests for that age is called his basal year. Any tests he passes at higher levels are credited so much to be added to the basal year, in obtaining the mental age. From the mental age and chronological age, the I.Q. can be readily computed.

Since the publication of Terman's Stanford Revision of the Binet-Simon Intelligence Scale, Terman and Merrill have been working to correct many of the imperfections of the earlier scale. In 1937 the Revised Stanford-Binet Scales were completed.¹ Working on the assumption that an intelligence test should attempt to obtain a general knowledge of the capacities of a subject by the sinking of shafts at critical points, Terman and Merrill in their revision have increased the number of shafts and have directed them at points shown by wider experience to be critical.

One of the most serious limitations upon the usefulness of the old scale was the fact that no alternative form was available for use in re-testing, or as a safeguard against coaching. The revision provides two scales which differ almost completely in content, but are mutually equivalent with respect to difficulty, range, reliability, and validity. These two scales are known as Form L and Form M. The fact that the same subjects were used in the standardization of Form L and Form M has made it possible to guarantee almost perfect equivalents of the scores yielded by the two scales. In standardizing the scales, an effort was made to obtain a representative sampling of the white child population in the United States between the ages of two and eighteen years. The sampling is much more extensive than in the 1916 scale and the authors have succeeded in reducing the sampling area inherent in age, grade, location, nationality, and geographical distribution.

¹See L. M. Terman and M. A. Merrill: *Measuring Intelligence*. 1937.

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The present tests cover a wider range, are more accurately standardized throughout, provide a richer sampling of abilities, and the procedures have been more rigidly defined. On the whole, Form L and Form M are less verbal than the old scale, especially in the lower years. A wider age range has been achieved since each form of the new revision provides, below the five-year level and beginning with the second year, tests that are located at half-year intervals. The gaps which existed at years eleven and thirteen have been filled, and the scale has been given more top by the addition of two supplementary levels for superior adults. The original Binet Scale had fifty-four tests and the first Stanford Revision had ninety. Each of the present scales contains one hundred and twenty-nine tests. The tests for the younger subjects have been made more interesting and more valid by the use of diminutive objects such as brightly colored cubes, wooden beads, and other attractive materials.

One aim of the revision was to secure greater objectivity in scoring. Where judgment is involved in evaluating responses to an item, definite principles and classified illustrations are now provided to guide the examiner. Full instructions for administering and scoring both forms are provided in Terman and Merrill's *Measuring Intelligence* (1937).

The Revised Stanford-Binet Scales may be considered a distinct improvement because they cover a wider age-range, they include a more adequate sampling of abilities, they are better standardized, and they are more valid and more reliable.¹

The tests include a wide variety of tasks which are to be performed under the directions of the examiner, such as counting pennies, naming colors, repeating digits from

¹These tests and test materials may be obtained from the Houghton Mifflin Company, Boston, Mass.

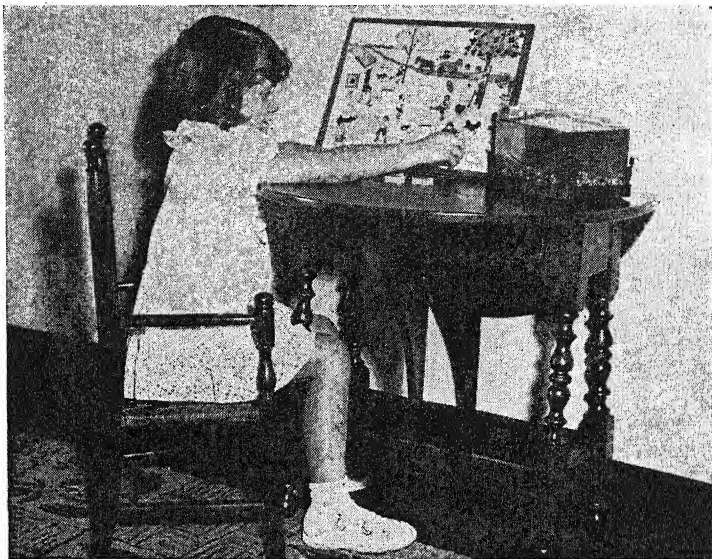
memory, giving the differences between familiar objects, indicating the similarities between familiar objects, defining words, arranging cubes in their order of weight, explaining absurdities, interpreting fables (generalizing), solving arithmetical problems, distinguishing abstract terms, and repeating the thought of a passage read by the examiner.

Special training is required for administering the test. The examiner must gain the coöperation of the person to be tested, he must know the instructions by heart, and he must be skilled in the scoring of the answers. Definite standards are furnished for scoring.

The Stanford-Binet and other tests of a paper and pencil sort which stress verbal ability cannot be used successfully with deaf children, foreign children, or children with speech defects. To take care of this class of individuals Performance Tests have been developed, involving such tasks as fitting pieces into a form board and completing pictures from which parts have been omitted. One of the best known of the scales is the Pintner-Paterson Performance Scale. The picture-completion test on p. 554 involves the fitting of the blocks with the objects depicted on them into the appropriate spaces in the picture to combine the separate activities into a meaningful pattern.

Measures of infant intelligence must obviously be predominantly performance tests. Arnold Gesell, in connection with his program at the Yale Psycho-Clinic, has been perfecting an intelligence scale for the infant and the preschool child. Gesell has standardized twelve developmental levels for the first twelve months of life, by noting whether the infant, at certain stages of his growth, can sit up, manipulate objects with one hand, manipulate objects with both hands, and so on.¹

¹See Arnold Gesell: *Guidance of Mental Growth in Infant and Child*. 1931. Refer to pp. 299-303ff. in this text.



PINTNER-PATERSON PERFORMANCE TEST

This is one of a series of picture-completion tests which have proved useful in estimating the degree of intelligence possessed by children for whom tests involving linguistic ability are sometimes unsuitable, as in the case of the foreign-born, the deaf, or those having speech defects. An objective score is obtained which is based upon the time, errors and number of moves taken in performing the task.

(By permission of Lowell S. Trowbridge.)

*Bühler
Baby Tests*

Charlotte Bühler, formerly associated with the University of Vienna, has also developed some excellent measures for infant intelligence. In planning her Baby Tests Doctor Bühler has tried particularly to fit the situations to the natural interests of the infant. She feels that the common conception of intelligence employed in testing places too much emphasis on the ability to think or the capacity for learning. Consequently, she directs her investigation beyond mere intelligence to the personality as a whole. Her test items are designed to measure the individual in all the varied aspects of his life, which she classifies for convenience into bodily control (B), mental

ability (M), social development (S), and manipulation of objects (O).

Some Tests of Bodily Control:

Holding the head up in the prone position. . . . Age: 2 months.
 Extricating himself from a diaper placed over his head while he is supported in a sitting position. 7 months.
 Sitting alone 8 months.
 Standing with support. 10 months.
 Climbing up on to a chair. This test is one item in a series allocated at the period of 1 year 9 months to 1 year 11 months 29 days; represented as 1;9—1;11 (+ 29).

Some Tests of Mental Ability:

Looking for the source of a sound. 3 months.
 Memory test—a box containing a ball is given the child for five minutes, the box is then taken away, and is returned after thirty seconds without the ball. The child is expected to look for the ball, and to turn in astonishment to the examiner. 10 months.
 Imitating beating a drum with two sticks. 1;3—1;5 (+ 29).
 Searching for the reflection behind a mirror. 1;6—1;8 (+ 29).

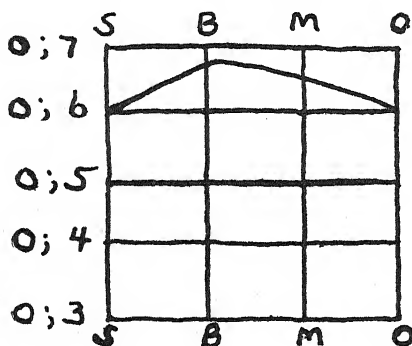
Some Tests of Social Development:

Response to an adult's glance 2 months.
 Organized play—the child is seated on a bed, his hands are held while he is pushed gently into the dorsal position, then lifted into the sitting position, three or four times each way. The examiner accompanies the movements with the words "up" and "down," and the child is expected to enter laughingly into the game, to follow the movements willingly, or to reach of his own accord for the examiner's hands in order to raise himself to the sitting position again. . . 1;0—1;2 (+ 29).

Some Tests for the Manipulation of Objects:

Defense reaction to the withdrawal of a toy. . . . 5 months.
 Crushing, rolling, or tearing a piece of white writing paper placed in the child's hand, or changing the form of the paper in some other way 7 months.
 Putting blocks back into a box 1;3—1;5 (+ 29).
 Placing blocks on top of one another . . . 1;9—1;11 (+ 29).

A profile may be drawn by plotting the scores as shown on the developmental profile.¹ Thus the examiner can



DEVELOPMENTAL PROFILE

S represents *Social reactions*

B represents *Bodily control*

M represents *Mental abilities*

O represents *Manipulation of objects*.

The figures at the left represent developmental age in years; months. This profile is that of a child with a chronological age of 0;5.

indicate graphically in what respects a child may be retarded or accelerated in his growth. The evidence may prove valuable in determining whether a child should be left in his own family or given to foster parents, whether he should be placed in an institution for normal or feeble-minded children, or whether he is to be considered worthy of adoption by interested people.

Excellent photographs of infant behavior under test conditions are now available in talking pictures, providing a vivid record of the work of Gesell and of Bühler for classroom demonstration. One striking feature of the Gesell film is the comparison of the activities of the same child at two different stages of development in the same situation, with the two records running simultaneously side by side.

The intelligence tests which we have so far described have been developed for use in examining the individual. During the World War the pressure of time provided a great stimulus to the promotion of group tests. Of these, the best known is the Army Alpha.

In April, 1917, the American Psychological Association

¹Charlotte Bühler: *The First Year of Life*, p. 201. 1930. By permission of John Day and Company, Inc.

appointed a committee of five psychologists, specialists in mental testing, to work under Robert M. Yerkes as chairman, in the devising of a test which would serve the following purposes:

- (a) To aid in segregating the mentally incompetent,
- (b) To classify men according to their mental capacity,
- (c) To assist in selecting competent men for responsible positions.¹

The committee surveyed all the available tests and selected their material with certain objectives in view:

1. To make it as independent of school information as possible.
2. To secure a wide range of difficulty, arranging the tests under each task in their order of difficulty.
3. To provide for easy objective scoring, eliminating subjective estimates by the scorer.
4. To involve a minimum of writing so that slow writers would not be penalized.
5. To produce a number of forms of the complete examination equal in difficulty in order to prevent coaching.
6. To set a time limit which would permit only the fastest examinees to complete the assigned task.

The Army Alpha examination was devised for general application; the Army Beta examination was planned for those who, for various reasons, were so handicapped in the matter of language as to require a performance test.

In standardizing the Alpha examination, the test was administered to elementary and high school children, students in colleges and officers' training camps, over 5,000 enlisted men, and inmates of various institutions for the feeble-minded. Its validity was checked against all the available criteria: among the students and the feeble-minded, by school grades, teachers' estimates, and other intelligence tests; among the soldiers, by officers'

¹C. S. Yoakum and R. M. Yerkes: *Army Mental Tests*, p. xi. 1920.

ratings, the rank attained, ability displayed in training, and previous civilian accomplishments.

During the period of 1917-1918 about 1,750,000 men were tested, a gigantic accomplishment and a great aid, on the whole, to the development of intelligence testing.

The Alpha examination comprised:

1. Following directions.
2. Arithmetical problems.
3. Practical judgment.
4. Synonym—antonym.
5. Disarranged sentences.
6. Number series completion.
7. Analogies.
8. General information.

After the War, the examination was used extensively in universities, where it did not prove so satisfactory, chiefly because the test had been devised for a wide range of ability in the army, whereas the range of ability is much narrower among college students who constitute a selected group of a superior order. F. L. Wells has revised the Alpha examination with this factor and other factors in mind. Military references have been eliminated. The material has been brought up to date. A simple addition test has been substituted for the original Directions of Test I, and a relatively elaborate Directions test for the Information of Test VIII. The Wells revision has been adapted for use among women as well as men, and has been planned for

that intensive psychometric study of superior individuals which is the practical purpose involved in the present studies. The advantages of the present revision are essentially those of convenience in administration, which is what was aimed at. The revision takes about four minutes less time to give and about two-thirds as long to score. The relative simplicity of the scoring processes may be also conducive to fewer scoring errors. . . . From the standpoint of correlation the ultimate de-

Wells
revision
Alpha

sideratum is maximal relationship not with Army Alpha but with something (intelligence) of which Army Alpha, like other tests, is an admittedly imperfect measure. The concept of this something is still so vague that only crude validation of an intelligence test is possible. During the year that the old and new tests have functioned side by side in individual, quasi-clinical examinations, their scores stand the pragmatic test about equally. It is well known that under such conditions it still makes rather less difference what tests are used than who uses them.¹

A sample of the Revised Alpha examination will clarify its nature.²

1. Addition

$$3 + 4 = \dots$$

2. Arithmetic

How many are 5 men and 10 men?....

3. Common sense

Why do we use stoves? Because 1, they look well. 2, they keep us warm. 3, they are black....(2)

4. Synonym—antonym

good—bad.....(o)pposite

little—small.....(s)ame

5. Disarranged sentences

A eats cow grass....(+)

Arrange in right order; if it is true, mark +; if it is false, mark —.

6. Number series completion

2 4 6 8 10 12 ...14... ..16...

7. Analogies

sky—blue :: grass—

TABLE GREEN WARM BIG....(G)....

See what the relation is between the first two words and

¹F. L. Wells: "Army Alpha—Revised," *Personnel Journal*, 1932, 10, 411-417. By permission of the *Personnel Journal*.

²By permission of the Psychological Corporation, Room 2045, Grand Central Terminal Building, New York.

write in the () at the end of the dotted line the first letter of the word in heavy type that is related in the same way to the third word.

8. Directions

Write the smallest of these numbers backwards.

13 21 64 18 16 ...**31**....

B. Uses. The value of these various intelligence tests, only a few of which have been enumerated, is manifold. The detection of feeble-mindedness and the sorting of ability in the army have already been mentioned.¹ Testing has been employed in the schools for grouping pupils according to their several abilities, so that the instruction may be adapted more accurately to the capacities of the students. Often a test is valuable in tracing school difficulties, the evidence being used to determine whether failure is due to lack of ability or to other factors such as poor instruction or lack of effort on the part of the pupil. Testing has been a valuable source of data in clinics for the discovery of mental defects, permitting the exact adjustment of treatment to the needs of the individual, and in vocational guidance, aiding the examiner in advising the occupation suited to the talents of the applicant. There are many other uses for intelligence tests. The expert examiner can analyze the various assignments and supplement his general advice with specific recommendations for the case involved. While the tests were first used for the detection of the subnormal, there has been much emphasis of late on the discovery of genius (super-normal), for the effective training of genius is of vast importance to society.

C. Criticism. The results of intelligence testing can only be considered valid when they are interpreted with a

¹For the uses of the Army Alpha and Army Beta tests during the Great War, see Yoakum and Yerkes, *op. cit.*

critical understanding. The tester must be aware of the importance of uniformity in administration and scoring, of the influence of variable experience under differing environments, and of the significance of the language factor in the prevailing paper and pencil procedure. He must appreciate the fact that, at best, a psychological test is only a rough measure of "intelligence."

What are some of the factors which must be kept in mind in the evaluation of intelligence testing?

1. *Equivocation.* The psychologist assumes, on the basis of certain premises involved in its standardization, that he is constructing a test of "intelligence." The fact that he calls the object of his investigation "intelligence" does not mean that it actually is intelligence he is measuring. The score on the test merely indicates what the score on that particular test is. If, for example, a child proves by the Stanford-Binet to have a mental age of ten, the result does not signify that he has a mental age of ten, but only that he has a Stanford-Binet mental age of ten, according to the norm of that particular scale. Two psychologists construct two different tests, and they both claim they are measuring intelligence. But are they both measuring the same thing? The assumption that they are both measuring the same thing involves the fallacy of equivocation, for while the two tests are equivocal (both being called "intelligence tests"), they are not necessarily equivalent.¹

2. *Sampling.* The psychologist who constructs an intelligence test must select certain tasks for the examinee, in accordance with his own particular conception of intelligence. The problem as to what abilities the test aims to measure and as to what their respective relations to intelligence are, constitutes an ambiguity of content.

¹H. M. Johnson: "Some Fallacies Underlying the Use of Psychological Tests," *Psychological Review*, 1928, 35, 328-337.

Selection of material, too, is determined somewhat by convenience, since tasks usually are chosen not only to suit a verbal paper and pencil test which is easy to administer in a short time, but also to yield data which are readily measurable.

3. Performance. An intelligence test measures performance—not capacity—in the test situation, and the very fact that the testee realizes he is under the pressure of an examination may militate against his doing himself justice. A test reveals, not what a man can do, but what he does do.¹ We sometimes say of a person who has committed a blunder that he knows better. In the given situation, however, his performance is what counts.

Lehman has made a study to determine at what ages men are likely to do their most outstanding work. In the course of his report he states: "This study makes no assumption whatsoever as to what ought to be. Nor is this investigation concerned primarily with the problem of *ability* to do creative work. On the contrary, we are here dealing only with *performance* . . . potential ability alone does not guarantee accomplishment. Indeed, it is doubtful that genius is solely the fruit of any single trait. It is the belief of the writer that the fruits of genius are, on the contrary, a function of numerous integers, including both the personal traits of the individual worker, environmental conditions that are not too hostile, and the fortunate combination of both personal traits and external conditions."²

Some psychologists insist that an intelligence test measures an inborn capacity for learning. Such an achievement, however, is impossible. A test can only measure what the individual has learned, not what he

¹J. H. McFadden: "The Will-o'-the-Wisp Intelligence," *Psychological Review*, 1932, 39, 225-234.

²H. C. Lehman: "The Creative Years in Science and Literature," *Scientific Monthly*, August, 1936.

can learn; it can reveal acquisition, not natural capacity. Any reference to inborn ability is merely an inference based upon performance. Actually, from what the individual shows he has acquired, the psychologist can estimate his capacity to acquire further; by plotting the course already traversed, the psychologist can predict the prospects of further progress.¹

Brigham found, in surveying the data of the Army Alpha examinations administered during the War, that the intelligence ratings of immigrants were directly proportional to the length of residence in the United States. This evidence means either that the newer immigrants are more stupid than the older immigrants, or that the Army Alpha measures what the individuals have acquired in their new environment rather than their innate abilities. Probably the latter conclusion is the more valid one to draw.²

If it is impossible to demarcate inborn and environmental effects with any absolute finality, there are two paths open to the tester who wishes to approximate a measure of fundamental capacity. First, he can endeavor to equalize environmental influences by choosing common tasks for which everybody has had some training, such as tying a bow knot. "The wisest procedure at present is to equalize environmental forces by using a wide variety of data with which all individuals have had adequate experience, and to make as correct allowances as we can for what we cannot equalize."³ Second, the psychologist can strive to present novel situations which may circumvent the effects of training, though this mode of procedure is subject to serious limitations. "Intellectual tasks, success in which requires zero training and is uninfluenced by

¹Knight Dunlap: *Old and New Viewpoints in Psychology*, p. 22. 1925.

²C. C. Brigham: *A Study of American Intelligence*. 1923.

³E. L. Thorndike, et al.: *The Measurement of Intelligence*, p. 462. 1927.

any kind or amount of training, do not exist and cannot exist, at least not in shape to measure appreciable amounts of intellect."¹

Performance, further, depends considerably upon the attitude of the testee, whether he is coöperative, whether he is embarrassed, whether he is ill, or whether he is trying to do his best. If he is not exerting his maximal effort, his potentialities will be underestimated. The examiner, of course, is supposed to secure coöperation by tactful preparation and to note any of the above factors which appear to be affecting the results. Complete control of these aspects of the situation is impossible. Again, it seems that in practice the criterion of intelligence must be performance, not potentiality. Perhaps some of the confusion would be avoided if we restricted ourselves, as suggested before, to the use of the adjective or adverb and avoided the noun, so that we should speak not of "intelligence" but of "intelligent performance," or say that in the test situation the individual "behaves intelligently."

4. Complications of Level, Scope, and Speed. The performances of individuals in intelligence tests vary in the level of difficulty achieved, some people being able to do harder tasks than others; in the number of tasks covered at a given level, some people being able to solve more kinds of problems, excelling others in the scope of their comprehension; in the speed of accomplishment, some people being able to work faster than others. Level and extent are positively correlated to a high degree, but level and speed are not so highly correlated, though the coefficient is positive. How are these factors, level, extent, and speed, to be weighted?

Many students feel that it is unfair in measuring intelligence to require speed, since they feel sure that they could do the tasks correctly if they were allowed the neces-

¹*Ibid.*, p. 436.

sary time. There are several answers to this objection. One is that speed is conceived as an element in intelligence. Some tests are, therefore, so constructed and administered that no one, no matter how bright, can possibly finish in the time allotted. If two persons perform a task correctly, and Jones completes the task in half the time it takes Smith, then Jones is the more intelligent. The time element, according to some psychologists, plays an important role in intelligence tests, since speed of reaction probably correlates highly with intelligence.¹ Another answer is that not all tests require speed, and that the time limits on group intelligence tests are probably quite fair to the majority of persons. In general, according to Pintner, it is advisable to set generous time limits, placing emphasis on difficulty or level.²

The Army Alpha scores show a positive correlation with the amount of schooling, that is, the more schooling the examinees have completed, the better their scores. The conclusion might be drawn that the Army Alpha examination—as charged against others too—is really a measure of scholastic aptitude rather than a measure of intelligence, but the situation is not simple enough to justify such a conclusion. It seems reasonable to suppose that the more able men made the highest scores on the Army Alpha, and that they also had the most schooling; for education is a highly selective process, in which only the more intelligent survive through the higher schools.³ To a large extent, it may be fair to assert that the Army Alpha, like other tests, measures both schooling and intelligence.

5. Verbal Facility. Most intelligence tests, being paper and pencil tests, set a premium on a special type of intellect which may be designated as literary intelligence, involving

¹H. Peak and E. G. Boring: "The Factor of Speed in Intelligence," *Journal of Experimental Psychology*, 1926, 9, 71-94.

²Pintner, *op. cit.*, p. 534.

³H. E. Garrett: *Great Experiments in Psychology*, pp. 45-47. 1930.

skill in the use of language. In general, intelligence tests measure academic ability, since their sponsors are usually professors of psychology who naturally incline to stress the line of endeavor in which they themselves excel. If tests were devised by carpenters and automobile mechanics, the emphasis would be diverted to mechanical ability. An investigation at Harvard showed that professors of language, though presumably no more intelligent than professors of chemistry and physics, excelled the latter in their undergraduate scores on the Army Alpha.

There are a number of pertinent comments respecting the verbal emphasis, worthy of mention. Terman states that verbal intelligence is of a higher order than mechanical intelligence or other kinds of intelligence, since it is the basis of conceptual capacity, the essence of understanding, the foundation of all great discoveries. Intelligence tests, therefore, should concentrate on the most important kind of ability, the aptitude for language.

In so far as intelligence tests have been used predominantly as measures of scholastic aptitude, it seems justifiable that they should stress the language ability which contributes more than any other factor to school success.

Furthermore, officers scored consistently higher than native-born white soldiers for each grade of education. That is, an officer would tend to score higher in a test than a private, though they had both completed only the grammar school. At each educational level, the scores were in order of ranking: officers, native-born whites, foreign-born whites, Northern negroes, Southern negroes. "These regular and consistent gaps in Alpha performance, for a constant amount of schooling, bear significant testimony to the part played by native ability."¹

6. Scoring. The mark on an intelligence test involves the method of scoring. Tests are made objective to

¹Garrett, *op. cit.*, pp. 45-46.

facilitate easy and rapid correction. In the valuation, the answer is either right or wrong. But "wrong" may be "just wrong" or "decidedly wrong," though no distinction is made between gradations of error. In an arithmetic problem, for example, one man may get the wrong answer through a mere mistake in calculation though he comprehends the problem, while another man may get the wrong answer because he does not grasp the problem at all. No distinction is made in the scoring. They are both "wrong."

Then, too, the units of measurement are arbitrary. Test scores are translated into mental ages and I.Q.'s with so many months credited for the accomplishment of one task and so many for another. On the average, the gradation may be valid though it may work out inequitably in specific cases. Further, suppose A scored 125 in the Army Alpha, B, 150, and C, 175. Is the difference between A and B equal to the difference between B and C in terms of intelligence? An absolute acceptance of their equivalence would be unwise.

M.A. and I.Q. are useful measures where children up to high-school age are concerned, but they are of doubtful value for persons of senior high-school level, college students, and superior adults. Other standards of comparison must be used when college students and adults are compared to others in their respective groups.

In the 1937 test there is relatively little yearly gain in score after a C.A. of 15. After this age, therefore, C.A. is disregarded in computing the I.Q. Furthermore, to take account of the gradual approach to this limit, adjusted I.Q.'s are computed after 13 by cumulatively dropping one out of every three additional months of chronological age from 13 through 15, and all, after reaching 16.¹ These figures are used in determining the C.A.

¹In determining the I.Q., therefore, an actual C.A. of 16 is computed at 15.

to be used in computing the I.Q., since Terman feels that intelligence has attained its full growth about this time. Intelligence matures rapidly in the early years of life, advances more and more slowly till the teens, and ceases to progress somewhere between 13 and 16. A person at 15, or so, will do as well in an intelligence test, therefore, as he ever will. Since the I.Q. is based on the ratio of M.A. to C.A., it would obviously be unfair to compute the I.Q. in terms of a C.A. over 15 if the M.A. does not increase beyond that age.

The average M.A. of the American soldiers was computed to be about 14, which seemed scandalous to those persons who were not aware of the complete maturation of intelligence at 15.

But does intelligence stop growing at 15? Those psychologists who believe it does, state that people may gain in experience after that age but not in fundamental ability. Such an assumption, however, supposes that a psychological test can differentiate native endowment from subsequent acquisitions, which is practically impossible. "Nature sets certain general limits, but for each individual there is a margin of safety or a range of accomplishment which is a function of the environment, and the extent of which can only be ascertained by individual effort under the most favorable conditions."¹

Is intelligence improvable? On the whole, test results have indicated a constancy of the I.Q., which coincides with the everyday observation that bright children grow into bright adults and dull children into dull adults. If A, B, and C rank 1, 2, and 3 in intelligence at the age of 5, the probability is they will still rank in that same order at the age of 10. If a child of 3 has an I.Q. of 110, he will probably have an I.Q. of approximately 110 when he reaches 15. A constant I.Q. depends upon constancy in

¹Dearborn, *op. cit.*, p. 309.

environmental conditions, constancy in schooling, constancy in culture or home conditions, and constancy in health. "A radical change in any of these conditions may affect the rate of individual mental development."¹ Intelligence is improvable, within limits, according to Dearborn. A dogmatic negative rests on the unjustifiable assumption that innate capacity can be isolated. Slightly below average performance may be improved through environmental changes to somewhat above average performance. A superior environment may raise the I.Q. 10 points or so.²

Some children do change in I.Q. as they grow, because of illness, sudden and great changes in environment when very young, and from other obscure causes, but the number so changing is small. The usual picture is one of steady regular growth of intelligence giving a constant I.Q. We cannot hold out the hope to the parents of the child of low I.Q. that he will suddenly change for the better at the mystical ages of seven or fourteen. More likely is it that his I.Q. will remain low, in spite of all that can be done.³

7. Summary. In view of all the factors we have surveyed, we may conclude that intelligence tests have much practical value if they are intelligently administered and intelligently interpreted.

IV. DISTRIBUTION OF INTELLIGENCE

Individual differences in intelligence approximate the normal curve in their distribution. About 1 per cent of

¹*Ibid.*, p. 28.

Stoddard, at the University of Iowa, has found that I.Q. may be raised by a good environment and lowered by a poor one. See G. D. Stoddard: "Contributions to Education of Scientific Knowledge about Mental Growth and Development," *Yearbook of the National Society for the Study of Education*, 1938, 37, Part II, 421-434.

²Gardner Murphy and Lois Murphy: *Experimental Social Psychology*, p. 107. 1931.

³R. Pintner in *The New Generation*, p. 437. 1930. By permission of The Macaulay Company.

the general population has an I.Q. below 70, about 1 per cent an I.Q. over 130:

I.Q. below 70.....	1 per cent—feeble-minded
.... 70-79	5 per cent—borderline
.... 80-89	14 per cent—inferior
.... 90-99	30 per cent—average
.... 100-109	30 per cent—average
.... 110-119	14 per cent—bright
.... 120-129	5 per cent—superior
over 130	1 per cent—genius

This perfect curve, of course, is only approximated in practice.

A composite picture of the "average man" has been drawn by Harry L. Hollingworth, a Columbia psychologist, on the basis of the evidence collected during the War from the intelligence examinations. The average man is, of course, an abstraction, a central point that we all approach to some extent. His vocabulary includes about 7,500 words. He can probably tell you what is meant by "nerve," but he will have difficulty with "coinage"; he understands "insure" and "shrewd," but he is not clear about "dilapidated" and "philanthropy." He may know from actual experience, but he cannot explain, the difference between poverty and misery. He can give three differences between a president and a king, but the difference between evolution and revolution seems to him not worth mentioning. If he has a whole minute for the problem he will get the correct answer when asked how many pencils can be bought for 50 cents if two pencils cost 5 cents. He can also find out how much seven feet of cloth will cost at 15 cents a yard. But he is completely lost when asked how many boxes there are in a collection in which one large box holds four small boxes, each containing four smaller ones. He can repeat seven numbers he hears, but if asked to repeat eight, he leaves out one of

them. He can repeat simple sentences such as "It is nearly half-past one o'clock; the house is very quiet, and the cat has gone to sleep." But if complicated instructions are given him, he will not be able to remember them all. The average man leaves school at the eighth grade. He has a smattering of local geography, knows a little bit about history, and knows a few elementary facts of physiology. In spite of the fact that he is to be accepted as a citizen, he has no general knowledge of civics, science, politics, or literature. He is able to speak one language only. On a standardized intelligence test he makes about the same score as does an average boy of fourteen. He never develops the intelligence required for satisfactory high-school work. In industry he is likely to drift into the skilled trades, but is not likely to have an occupation superior to that of his father. After a short period of training he can become a plumber, a carpenter, a mechanic. He marries at an early age, and has from three to five children.

Frederick Osborn of the American Museum of Natural History and Frank Lorimer of the Eugenics Research Association have administered a battery of mental tests in a nationwide survey of intelligence. Generally speaking, they found that the city child has a higher intelligence quotient than his country cousin. The widest, the most consistent, and the most interesting differences in intelligence revealed in their study lay in the distribution of the population by occupational groups. The children of professional men have, when considered in large numbers, consistently the highest intelligence quotient; the offspring of business and clerical fathers ran second; the skilled and semi-skilled workmen next, the unskilled laborer next, and the children of the farmer are to be found in the rear.¹

One impression that has resulted from the wide appli-

¹The Literary Digest, June 3, 1933.

cation of intelligence testing is the tremendous range of differences among individuals with respect to their mental capacities.¹

At one end of the distribution curve of intelligence are the feeble-minded who constitute a grave social problem, since they turn so readily to crime if the proper safeguards are not taken in their training. In juvenile courts about one out of three children charged with delinquency is subnormal mentally. About one out of every four wayward girls is deficient in brains. Furthermore, the care of the feeble-minded imposes a severe financial burden upon the community. In Massachusetts, for example, about one fifth of the annual budget is devoted to this item.

Feeble-mindedness is largely hereditary.² Certain common types of defect, however, are nonhereditary, such as cases of Mongolian idiocy; cases of focal brain lesion with resulting mental defect; types caused by injury to the brain at birth or during infancy, or by acute inflammation of the brain or membranes, or by syphilis; and cases of cretinism due to thyroid insufficiency. Plans for dealing with the feeble-minded must take care of providing for both the hereditary and nonhereditary cases.³

The feeble-minded are usually classified:

Idiot —M.A. of 2 years or less

Imbecile—M.A. of 3-7

Moron —M.A. of 8-12

Since hereditary types of the feeble-minded tend to propagate their own kind, and since they tend to multiply rapidly, eugenicists have suggested segregation, colonization, and sterilization as remedial measures. Certainly it

¹See O. Klineberg: *Race Differences*. 1935.

See also R. S. Ellis: *The Psychology of Individual Differences*. 1928.

²H. H. Goddard: *Feeble-Mindedness: Its Causes and Consequences*. 1923.

³W. E. Fernald: "The Feeble-Minded in the Community," in *Social Aspects of Mental Hygiene*. 1925.

is incumbent upon the majority to provide a special environment for the mental defective where he can adapt himself, preferably in an institution designed for that purpose.

It is cruelly unfair to expect the feeble-minded individual to adjust himself to the demands of ordinary society, because he lacks the particular level of intelligence fixed by social necessity. As Binet put it, "A French peasant may be normal in a rural community but feeble-minded in Paris." The defective is intelligent enough to live successfully in a simple environment. It is only just, therefore, to see to it that that simple environment, in the form of institutional care, is provided for him.

The mental defective is not simply slow. He is incapable. He cannot be trained to perform well a task beyond his mental level. It is important, therefore, to determine the level of intelligence demanded by certain tasks, to ascertain the mental level of the individual, and then to relate the two accordingly. Intelligence testing has made an important contribution to the procedure of selection and the adaptation of training.

The mental defective is incurable, but he is usually teachable within limits.¹ It is folly to try to teach him reading and writing in the public school, as the effort will be wasted, and such a policy will be apt to discourage the pupil and to convert him into a disciplinary problem. He can be taught specific habits—how to eat with a fork instead of his fingers, how to dress, how to comb his hair, and how to obey commands without resorting to tantrums—all of which may promote healthful recreation and social contacts.² Vocational training should be confined to simple tasks of a manual sort, and routine work should be planned to absorb his energy.

¹See S. L. and L. C. Pressey: *Mental Abnormality and Deficiency*. 1926. See also H. Woodrow: *Brightness and Dullness in Children*. 1919.

²Leta S. Hollingworth: *The Psychology of Subnormal Children*. 1924.

Moral training is especially important, since the mental defective is apt to become a menace if he remains in society. Eleanor Wembridge has written delightfully of this problem. She tested some morons:

If two pencils cost five cents, how many can you get for fifty cents?

Flora: 25 because 2 into 50 is 25.

Lucille: 100 because 2 times 50 is 100.

Annie: 5 times 50, because 5 cents times 50 cents is 5 times 50—whatever that is.

Chuck: 10—You get 2 for 5 and 2 times 5 is 10.

Such persons should not be expected to conduct their financial affairs with prudence; nor should they be expected to be prudent in other matters involving ethical issues. There can be little appreciation of moral principles.

The fable of the crow who was flattered into dropping her meat in order to sing was interpreted:

"That's like Lucille. These flappers. It don't pay to be led by flappery."

The fable of Hercules and the wagon provoked:

"It teaches how to drive cars."

"Don't go in holes."

"Learn about the roads."

"Unharness oxen."

"Always put wheels on your shoulders."

"Shouldn't go with boys in a machine because they make you walk."

"Shows how to be nice to a horse."

"It teaches a lesson all right."

A moral appeal to principles must fail where such a low grade of intelligence is concerned. Training must be based on the inculcation of blind obedience to conventions, such as "a woman's place is in the home," for Queen

Victoria knew her morons. The limitations of the defective must be constantly kept in mind, for "we are not sauntering with Socrates in Athenian groves. We are sitting with Jenny in jail."¹

At the other end of the intelligence scale are the geniuses. The term *genius* is used here, not to describe the possessor of a special talent for poetry or music, but to denote persons with an I.Q. over 135 or so. The geniuses have been as grossly misunderstood as the mental defectives by the general public. Child prodigies are generally regarded as frail, sickly, nervous, eccentric, maladjusted, one-sided, hard to get along with, lacking in moral and emotional balance, liable to break down mentally and nervously, to "peter out," and either to die young or else to land in the penitentiary or in the school for the feeble-minded or in the hospital for the insane. One American editor asked Wiggam to write an article showing why it is that nearly all great geniuses had been very dull children! All of these popular notions have been disproved by a research conducted under the leadership of Terman, over a period of fifteen years, in which 1,000 gifted California children have been subjected to thorough mental and physical examinations. The results have been published in three volumes under the title, *Genetic Studies of Geniuses*. All the techniques of psychological and medical science have been used in the study of these children of unusual mental superiority, and in following them into adult life for the purpose of comparing final achievement with early promise. The research has also included an investigation of 300 of the world's most eminent individuals (popularly called geniuses) of the past 400 years for the purpose of finding out how their careers from childhood on compare with the modern generation.

¹Eleanor Wembridge: *Life Among the Lowbrows*, p. 255. 1931. By permission of and by arrangement with Houghton Mifflin Company.

After selecting the children with much care, Terman and his associates studied their mental, physical, and personality traits exhaustively. They found that the children came from homes superior in parental care and cultural influences. Seventy-three families in the group yielded two subjects each, and nine yielded three or more. Nearly a quarter of the members of the Hall of Fame are known to be related to one or more of the subjects. Gifted children come predominantly from families in which superior ability and achievement have been evidenced. There was an appreciable negative correlation between the I.Q. of the child and the number of children in the family.

Anthropometric measurements showed that the gifted children were above the standards for American-born children with respect to average height and weight, lung capacity, width of shoulders, and strength of muscles, and were in general physically superior to children taken at random in the school population. The popular notion which caricatures the man of great intellect with a puny body is thus definitely disproved by overwhelming evidence.¹

Nearly all the gifted children are in a school grade considerably below that which corresponds to their mental age. No evidence was found for the widespread belief that gifted children actually dislike school. No evidence, to speak of, was found to warrant the belief that the superior intellectual attainments of the group were due to artificial stimulation by the parents. In fact, in many cases, the parents were not even aware of the child's superiority.

The Stanford Achievement Test, a four-hour examination affording a dependable measure of the child's proficiency in all of the leading subjects of the elementary school education, exploded the common belief that the abilities

¹See D. G. Paterson: *Physique and Intellect*. 1930.

of gifted children are excessively specialized or one-sided, for the scores revealed an exceptional regularity in the various subjects.

The group manifested an interest in the more abstract subjects such as literature, dramatics, and arithmetic, and a lack of enthusiasm for the manual subjects such as penmanship, manual training, and sewing. The gifted children read on a wide range of topics, concentrating on science, history, biography, travel, informational fiction, poetry, and drama, and devoted less time to books of adventure, mystery, and emotional fiction.

The play interests and social interests appeared normal. It is the exception and not the rule for the gifted child to be regarded by his playmates as queer or peculiar. Faults of character are unquestionably less common among intellectually superior children in general.

A follow-up study shows that early promise is realized as the child matures. Unfortunately, many schools attempt to meet the needs of the brightest children by granting extra promotions. Other educators, with more insight into the situation, favor the establishment of special classes for the gifted.¹

V. THE EMPLOYMENT OF INTELLIGENCE

Intelligence is of no practical value unless it is used.

Suppose we find that a person has a certain I.Q. Can we be sure that he will use his ability? That will depend on how much backbone he has, how much he will sacrifice for his education, how many headaches he will bear, how long he will stick to a challenging mental task.

The responsibility for failing to "use our heads" lies largely in our emotional training. Emotional excitement

¹Material largely gleaned from Terman's article, "Talent and Genius in Children," in *The New Generation*, pp. 405-423. 1930. See also L. Hollingworth: *Gifted Children: Their Nature and Nurture*. 1926.

tends to obscure clear thinking, and thus to nullify the advantages of intelligence. Man lives not by bread alone, but principally by such catchwords as scofflaw, killjoy, copperhead, carpetbagger, scalawag, pacifist, scab, slacker, and profiteer, terms which serve to determine his attitudes so effectively as to exclude intelligence. Medical men did not attack microbes with emotional phrases but with patient research. Political questions, however, are settled by orators who sway men's minds by stirring their emotions, realizing that people cannot think straight under high emotional tension.

Poetry, romantic prose, and emotional oratory are all of inestimable value, but their place is not where responsible decisions must be made. The common (almost universal) use of emotional words in political thinking is as much out of place as would be a chemical or statistical formula in the middle of a poem. . . . Let us think calmly and scientifically about war, and then actively oppose it with all the passion of which we are capable.¹

Many persons are convinced in each presidential election that if their particular candidate is defeated it is only a question of time before the day of doom will descend. Reactionaries feel that it is best to stick to the tried-and-true measures because anything in the way of an experiment is dangerous. But as Justice Brandeis said, in his dissenting opinion in the Oklahoma Ice Case, "If we would be guided by the light of reason, we must be bold." Boldness, unfortunately, is too often confused with rashness, and condemned accordingly by people who fail to realize that boldness is as important for the solution of our social problems as intelligence, since timidity discourages the practice of thinking.

The lack of social-mindedness is responsible for much

¹R. H. Thouless: *Straight and Crooked Thinking*, p. 19. 1932. Reprinted by permission of Simon and Schuster, Inc.

wasted intelligence. We are so self-centered that we do not pause to consider how we might plan to help the other fellow whose welfare is so intimately linked with our own. We destroy in a Fourth of July bonfire enough fuel to warm the homes of the poor in the community for an entire season, thus expressing our patriotic fervor with no regard for our less fortunate neighbors who are compelled to paw through the rubbish in the city dumps to secure the bits of wood to heat their houses. Similar waste is encouraged in industry by the producer whose interest in profits exceeds his interest in the welfare of the consumer, so that ingenuity in production is dedicated to inventing new ways of manufacturing an article that will wear out in the shortest feasible time.

Intelligence has been devoted to the development of the physical sciences to the neglect of the social sciences, a fact which is well symbolized by the anomalous situation in Chicago when the Fair of 1933 was opened by a beam of light from Arcturus forty light-years away, during a time when municipal mismanagement and corruption rendered it impossible to collect taxes or to pay school teachers.

Science must be motivated by love if the human struggle is going to achieve a more intelligent level of existence.

Men sometimes speak [says Bertrand Russell] as though the progress of science must necessarily be a boon to mankind, but that, I fear, is one of the comfortable nineteenth-century delusions which our more disillusioned age must discard. Science enables the holders of power to realize their purposes more fully than they could otherwise do. If their purposes are good, this is a gain; if they are evil, it is a loss. . . . This is why the heart is as important as the head. By the "heart" I mean, for the moment, the sum-total of kindly impulses. Where they exist, science helps them to be effective; where they are absent, science only makes men more cleverly diabolic.¹

¹Bertrand Russell: *Icarus, or the Future of Science*, p. 57. 1924. Reprinted by permission of E. P. Dutton & Co.

The world suffers from the machinations of the intelligent who lack the kindly impulse, but it suffers as well from the blunders of men who "mean well" but whose stupidity is only rendered the more dangerous by their utter spirit of benevolent devotion. Human nature will destroy us unless it is disciplined by knowledge. Emotion must be definitely under control if intelligence is going to be of any avail.

In the midst of a profound economic depression, many counselors are urging that nature be allowed to take its course, that other depressions have come to an end sooner or later without resort to radical panaceas, on the assumption that economic cycles are inevitable, and that there is no use in trying to stop them. A new spirit, however, is developing, which is inspiring a determination in us to remain no longer the victims of circumstance, but to become the masters of our destinies. It is beginning to dawn on us that our own wrongheadedness is responsible for our recurrent hard times. We are coming to realize that events may be brought within our control if we are willing to subordinate our passionate self-interest to the pursuit of ends that have social value, and if we are willing to capitalize the intelligence that is available to us in the achievement of those ends. Such a goal has been the hope of science since the days of Francis Bacon. It is an ideal within our grasp if we are determined to make the effort necessary to its realization.

SUMMARY

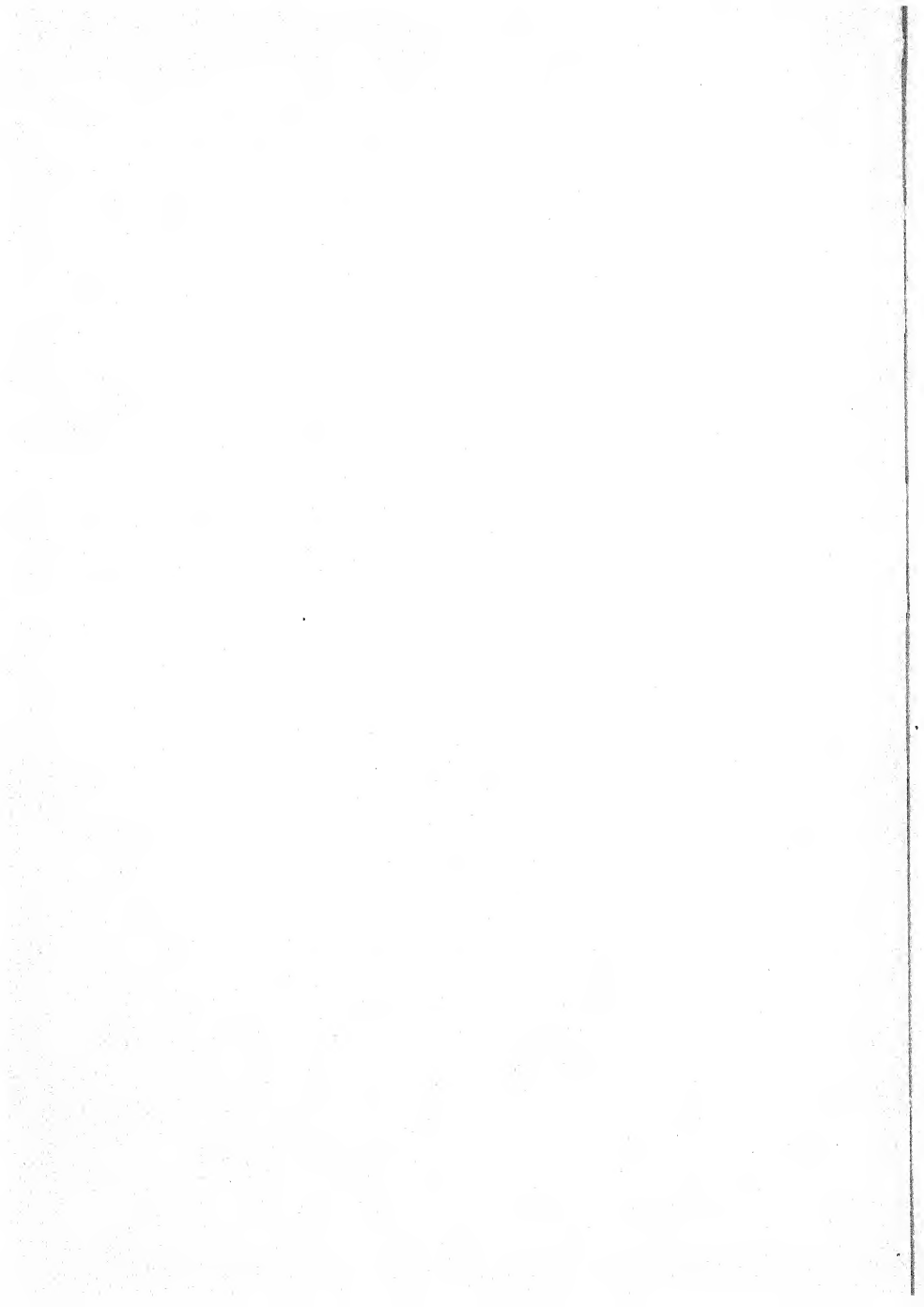
Intelligence is not a thing people have, but a way of behaving. A person acting intelligently adapts himself successfully to the situation at hand. The more situations there are to which he can adapt himself effectively, the more intelligent he may be said to be.

Intelligence involves a number of different factors, such as learning capacity, the ability to think abstractly, mental alertness, sound judgment, emotional balance, and general adaptability.

Intelligence testing provides a technique for sampling a person's abilities in order to predict, with reference to a standard, how probable will be his success in solving the variety of problems involved in school and occupational endeavors. Results must be interpreted in the light of certain difficulties apparently inherent in the testing situation.

The distribution of intelligence approximates the normal curve.

Intelligence is of no social value unless it is applied to ends that are worth while.



PART V
PERSONALITY: ITS MEASUREMENT AND ITS
SOCIAL SETTING

In Part V we shall deal with personality. Chapter 13, "The Measurement of Personality," will examine how psychology has developed techniques for measuring motor abilities, perceptual capacities, aptitudes; also personality traits, interests, and attitudes. The methods of treating data statistically will be surveyed. Chapter 14, "Personality and Social Living," will describe personality in its social implications, indicating how the individual is socialized, though still retaining his essential individuality. Ways of meeting certain fundamental personal problems will be surveyed, with reference to the formulation of an adequate philosophy of life.

THE MEASUREMENT OF PERSONALITY

PSYCHOLOGY has endeavored to approximate the exactness of the physical sciences by measuring the variables with which it deals. This attempt at quantitative precision is accompanied by an interest in descriptive or qualitative delineations. In many branches of psychology, especially those studying the more esoteric forces of the personality, the qualitative approach predominates. If, for example, another person's automobile collided with yours, it would be important to measure the time expiring before you could become aware of your predicament, and to determine the magnitude of the changes in your circulatory system; in addition, it would be of concern to ascertain the quality of the emotion evoked in you, and the nature of the thoughts that might be running through your mind.

Description can be rendered more accurate by subjecting data to measurement. It is one thing to say of a man that he looks very intelligent and quite another to state that he scores 170 on the Wells Revision of the Army Alpha. Of course, the quantitative description of human behavior may appear to be more accurate than it really is, for it is difficult to control all the variables that inhere in human nature. It is much easier, for example, to measure how fast a man can run one hundred yards than it is to measure how much a workman hates his boss. We must

recognize, therefore, that some measurements in psychology are more reliable than others merely by virtue of the kind of behavior which is being studied.

We have already mentioned the techniques by which reaction time, affectivity, and drives are measured. There are other measurable phenomena meriting our attention, such as motor abilities, perceptual capacity, aptitudes, and personality.¹

I. MEASUREMENTS OF MOTOR ABILITIES

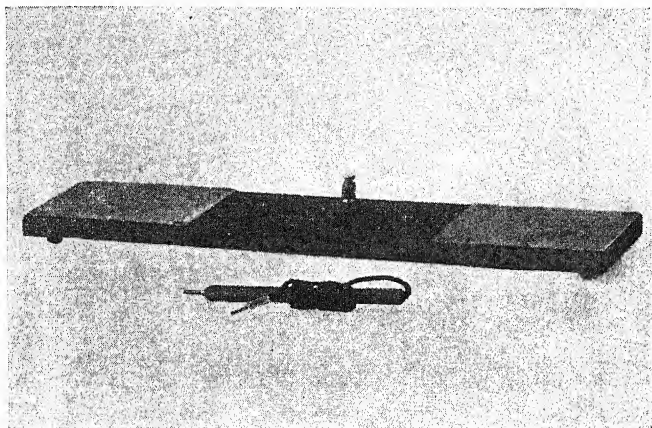
Tests of motor abilities have become popularized by the emphasis of present-day schools upon athletic games requiring physical agility and skill, and by the recognition of the value of these tests in industry. The interest in this type of testing may also be due to the comparative simplicity of the tests and apparatus, and the definiteness of the results. In personality tests, and in tests of the higher mental processes, psychologists experience difficulty not only in obtaining results that are valid and reliable, but also in accurately defining that characteristic which is measured. Motor Tests measure relatively elementary and homogeneous processes that can be isolated and controlled with some degree of success. The tests measure rapidity and accuracy of movement and the coordination of perceptual processes. Some of these tests are:

A. Tapping Tests. The Tapping Test measures the rapidity with which a person can tap on a hard surface. In the laboratory a stylus (a pencil-shaped instrument with a metal end) is held in the hand and a metal surface is tapped. The two pieces of apparatus are wired in such a way that when the stylus touches the steel plate a contact is made that turns an electric counter.

¹Thelma Hunt: *Measurement in Psychology*. 1936.
See also J. P. Guilford: *Psychometric Methods*. 1936.

This test can be performed with a blunt pencil and a piece of heavy paper. In this case the test should be of short duration, say a few seconds, to avoid the placing of dots over one another.

Certain types of Tapping Tests are effective in measuring muscular control and eye coördination as well as speed.

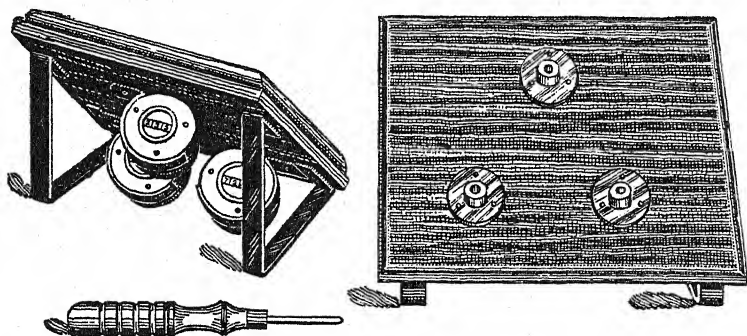


TAPPING TEST

(Reproduced by courtesy of the Marietta Apparatus Company.)

The Three-Hole Test is an example of this. Three holes are located in a triangular position on a board tipped at a 45° angle from the horizontal. The subject is told to place a stylus accurately and quickly in the holes in a fixed order until a certain time has expired. Some Three-Hole Tests have an electrified surface around the holes so that the errors can be recorded on an electric counter. This test can be duplicated with a fair degree of success by drawing squares or circles on a piece of paper and instructing the subject to place a pencil dot in the center of each figure. The test can be made complicated by distributing the figures over the paper in haphazard manner, or varying their sizes.

Tests closely related to those just mentioned have been devised to determine a person's skill in aiming at objects. Considerable variability from person to person will be shown in these measuring devices, because in many individuals who take the tests past experience plays a more important part than it does in the Three-Hole Test. Examples of this kind of test would be experiments involving the throwing of rings on a peg or post, the hitting of targets with darts, or the throwing of balls into holes.



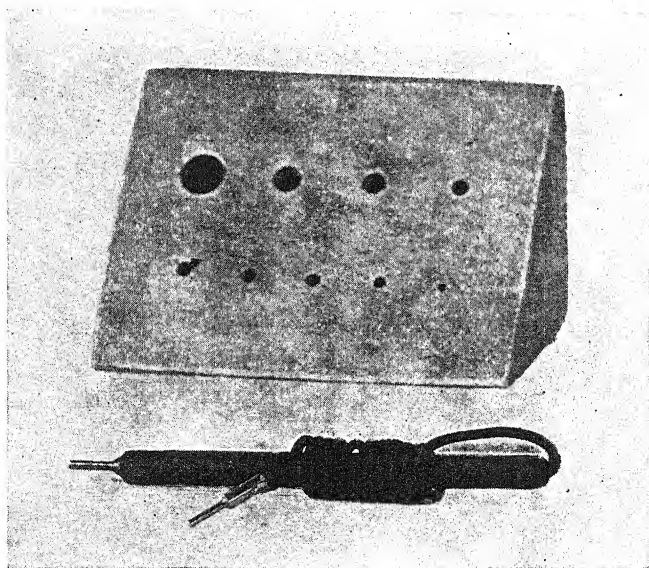
THREE-HOLE TEST

(Reproduced by courtesy of the C. H. Stoelting Company.)

B. Steadiness Tests. The Steadiness Tests measure the voluntary control of the tremors of the hand and arm. In the Nine-Hole Test, the subject is first instructed to place a stylus into the largest hole. When he has done so, the experimenter says "go" and the subject attempts to keep the stylus in the hole for fifteen seconds without touching the rim. This procedure is repeated with the other holes, care being taken that the subject does not rest his arm or hand on any support. When the stylus touches a rim a contact is made and the electric counter records the error. This test has been used successfully as an aid in selecting men for industries where manual

dexterity is involved, as in the work of watch assemblers and repairers, typesetters, and engravers.

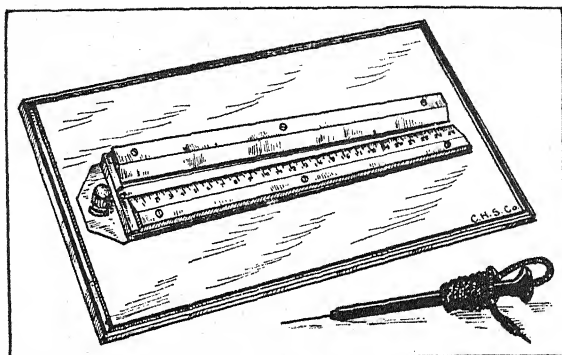
Tracing Tests, requiring the subject to trace a pointed instrument, such as a pencil or stylus, along a very narrow area, measure steadiness and motor coordination. If the



STEADINESS TEST

(Reproduced by courtesy of the Marietta Apparatus Company.)

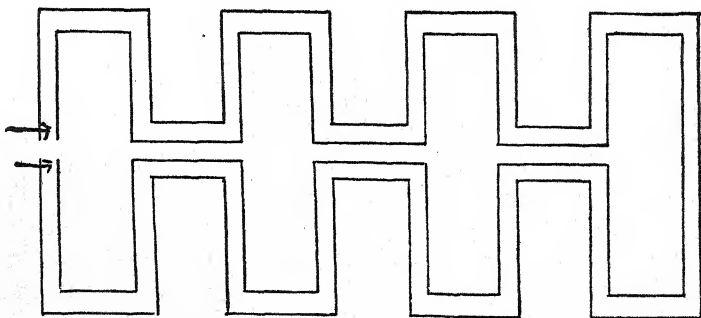
tracing board illustrated on the next page is used, the subject is told to insert the stylus in the wide end of the groove and pull it toward himself without touching the sides. The subject may continue along the groove until he strikes one of the sides, or he may be instructed to draw the stylus from one end to the other. In the former case the points on the scale where the contacts occur are recorded, and an average is taken of several trials. In the latter procedure, the total number of contacts is used as an indication of the subject's ability to perform the test.



TRACING BOARD

(Reproduced by courtesy of the C. H. Stoelting Company.)

The reader may set up his own Steadiness Test by drawing diagrams similar to the one given below. Steadiness will be measured in terms of the total time consumed in completing the test, and the number of times the subject touches or goes beyond the guiding lines. Eye-hand coördination is involved.

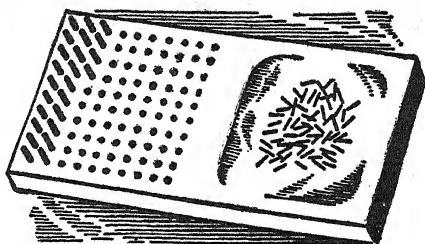


C. Dexterity Tests. Johnson O'Connor has devised two tests for measuring finger and hand dexterity. The O'Connor Finger Dexterity Test consists of a board on which 100 holes have been drilled at equal spaces apart and a tray containing slightly over 300 pins. The sub-

ject is required to insert three pins in each of the 100 holes, and the total time is taken as an indication of finger dexterity.

The O'Connor Tweezer Dexterity Test is similar to the finger test with the exceptions that tweezers are used and one pin is inserted in each hole.

D. Other Tests. The Pursuitemeter, as built by the Marietta Apparatus Company, is very effective in measur-



O'CONNOR FINGER DEXTERITY TEST

(Reproduced by courtesy of the C. H. Stoelting Company.)

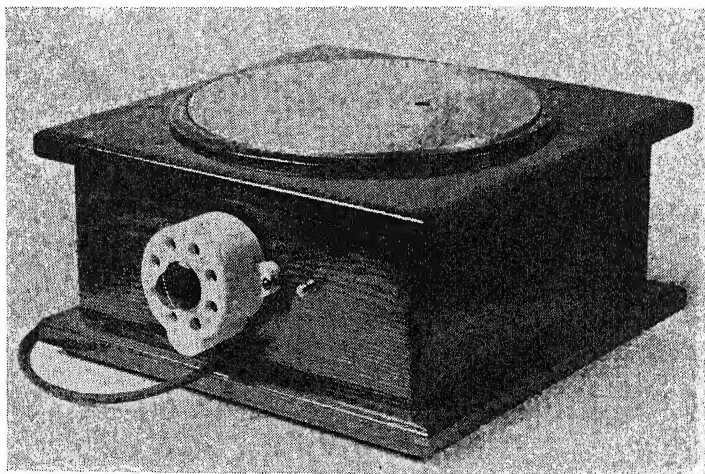


TWEEZER DEXTERITY TEST

Johnson O'Connor's work-sample No. 17

(Reproduced by permission of the National Youth Administration for Massachusetts.)

ing eye-hand coördination in a rapidly changing situation. The instrument has the appearance of a table gramophone with a rotating metal disc about 12 inches in diameter on top. On the surface of this disc, and flush with it, is a smaller circle somewhat off center that rotates at a speed at variance with the disc that surrounds it. On the surface of this disc, and also off center, is a black disc one-half inch in diameter that is the only portion of the entire



PURSUITMETER

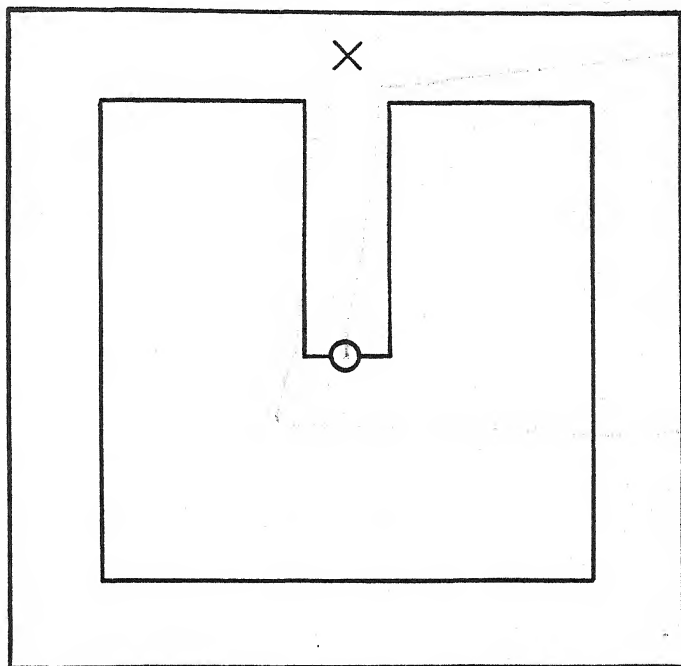
(Reproduced by courtesy of the Marietta Apparatus Company.)

surface that is a non-conductor of electricity. The subject attempts to keep the stylus on the black spot, and when he fails to do so, an electric counter indicates his errors.¹ Another device indicates the total time off and on the spot.

The author has devised a simple test that roughly measures (1) the ability to retain a visual impression after the eyes have been closed and (2) the ability to appreciate

¹See G. L. Freeman and C. R. Oldroyd: "A New Pursuit-Meter," *American Journal of Psychology*, 1937, 49, 476-477.

distance without the aid of the eyes. Place the point of your pencil in the circle and look over the situation. Keep your non-writing hand at your side. Without moving the pencil, plan the route that you are going to trace, proceeding vertically from the circle to x, turning



to the right and following the aisle all the way around until you return to x, and then heading directly for the circle. Close your eyes when you are ready and trace the above route as accurately as you can. The task is more difficult than it seems at first notice. Study your performance and then repeat the experiment with a colored pencil to see if you can improve your accuracy.

A few concluding remarks may be made in regard to

tests of motor abilities. No one test is of paramount importance because each test measures only a small part of the motor system. To determine a person's motor capacities, a battery of tests must be employed, the selection of the individual tests being dependent upon the purpose of the study. Chamberlin, by experimentation and elimination, found that in the selection of finishers in an electrotype company, the Nine-Hole Steadiness Test, the Three-Hole Motor Coordination Test, and the Pursuimeter Test give results upon which, when other data as to the subject's observational ability and mental alertness are considered, a reliable judgment can be made as to the likelihood of the applicant's success on the job. Of course, the test must be weighted properly, that is, in the statistical treatment some tests are recognized as more influential than others in the determination of the rating of the subject.

The tapping, tracing, steadiness, and pursuit tests have been used extensively in psychological laboratories to discover certain principles which have been embodied in batteries of tests developed for occupational guidance. Tapping is incorporated in the MacQuarrie Test for Mechanical Ability,¹ a paper and pencil test that is being widely used in vocational counseling. This Test, being a paper and pencil examination, is easy to administer. A series of circles is provided for the subject and the task is to take a pencil and tap three dots in each circle as rapidly as possible. Tracing is tested by having the subject trace a prescribed course with a pencil on a complicated diagram. The principle of the steadiness tester is embodied in a dotting test in which the individual uses a pencil to put one dot in each circle of a series, the dots being arranged at odd intervals. Pursuit is examined by a task in which

¹Published by the Southern California School Book Depository, Ltd., 3636 Beverly Boulevard, Los Angeles, California.

the subject is required to follow with his eyes a series of irregular lines, each line proceeding from a numbered square at the left to a numbered square at the right.

Tweezer Dexterity is a useful test in examining applicants for jobs requiring the manipulation of fine precision tools, such as are involved in setting jewels on pinions in watch-making or watch-repairing, the manufacture of fine automobile parts, and the filling of teeth in dentistry.

Surgeons and dentists must be craftsmen. "Clearness of eye, delicacy of tactile discrimination, steadiness and strength of hand, dexterity of fingers are obvious necessities."¹ Students in dental schools not infrequently pass the biological, physiological, and anatomical courses of the first two years and then have to drop out in the third year because they cannot master the mechanical intricacies and the manual techniques of dental practice. Hence it is important that a battery of tests designed to measure aptitudes for dentistry must include several which sample a candidate's manual and mechanical aptitudes.²

Each test of motor ability is in itself a test for some particular operation. A good score in one test does not mean a person will make a high score in another. A battery of tests is valuable for measuring manual versatility.

II. MEASUREMENT OF PERCEPTUAL CAPACITIES

The problem of measuring the sensitivity of the organism to external stimuli excited the interest of the psychologists in the middle of the nineteenth century. E. H. Weber's name is associated with this attempt to employ experimental methods in psychology. His efforts resulted in the psychophysical method which studies the effect of

¹W. V. D. Bingham: *Aptitudes and Aptitude Testing*, p. 184. 1937.

²Bingham, *loc. cit.* Mechanical aptitudes are described on pp. 602-603 of the present text. Manual aptitudes are involved in mechanical aptitude; but mechanical aptitude includes, in addition, the ability to solve mechanical problems, the ability to plan mechanical devices, among others.

physical stimuli upon an organism.¹ Weber investigated sensory perception to determine the smallest noticeable difference between two impressions, such as impressions of sight, hearing, and touch. He discovered that in lifting weights with the hands, a difference of one gram could be discerned if a thirty-gram weight was used as a standard; that is, a twenty-nine and a thirty-one gram weight could be respectively perceived as lighter and heavier than the standard. Weber found that the just noticeable difference (j.n.d.) was not a constant unit and that, as the stimulus increased in magnitude, a greater increment was required to produce an awareness of difference. Noticing that the j.n.d. could be expressed as a proportion of the magnitude of the standard stimulus, he formulated a principle known as "Weber's Law," a satisfactory explanation of which is still forthcoming. He explained that the j.n.d. is not an absolute unit unrelated to the stimulus, and that the magnitude of increase in the stimulus necessary to bring about an awareness of a difference bears a constant relationship with the standard stimulus. Fechner modified Weber's Law by describing the relationship as one between the sensory processes and the magnitude of the stimulus, in which the stimulus must be increased logarithmically, and not arithmetically, to produce a series of j.n.d.'s.² Since experimental data do not comply exactly with the demands of the Weber-Fechner Law, many psychologists now consider the law to be merely a generalization of historical interest.³ For our purposes it is sufficient to know that if an observer is subjected to

¹Psychophysics comprises certain methods, which we are about to describe, for measuring the relationship between a stimulus and the conscious reaction provoked by it.

²If 11 is just distinguishable from 10, then 110 will be just distinguishable from 100, 1100 from 1000, and so on.

³For a modern interpretation of this law, see H. Hoagland: "The Weber-Fechner Law and the All-or-None Theory," *Journal of General Psychology*, 1930, 3, 351-373.

an intense stimulus, more of an increment must be added to produce an appreciation of a difference than if he were attending to a weak stimulus. This generalization may be applied, in a sense, to everyday life. If all the money you possessed were ten cents, you would notice the loss of a penny, but if you were affluent to the extent of ten dollars, this loss might be overlooked.

Psychophysical methods are frequently used for the measurement of perceptual capacities. Much confusion has resulted from the countless variations of, and numerous names given to, psychophysical methods. However, there are three fundamental methods, and these will be explained briefly. All the methods involve a standard and a comparison stimulus. The comparison stimulus is judged in terms of the standard. The three methods involve different presentations of the variable stimulus.

A. The Method of Limits. In the Method of Limits, the variable or comparison stimulus is set by the experimenter so that it is noticeably different in magnitude from the standard. Let us say that the experiment involves the judgment of the saturation (nearness to black) of one gray as compared with another. A revolving disc is used with the standard gray in the middle and the variable outside.

The saturation of the variable can be regulated by varying the proportion of black and white; the two colors produce an impression of gray when the disc is rotated.

Let us start with the variable considerably more saturated (darker) than the standard gray. The variable is gradually rendered less and less saturated by increasing the proportion of the white to the black, until a point is reached, before arriving at the standard gray, where the variable is judged to be equal in saturation to the standard.

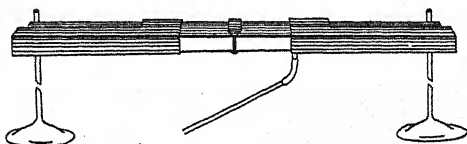
The next step is to begin with the variable equal to the standard, and gradually to increase the saturation of the

average of these two averages is the j.n.d. (or difference limen) between the standard saturation and the greater saturation, that is, between the standard gray and a darker gray.

A similar procedure will establish the j.n.d. between the standard saturation and less saturation, that is, between the standard gray and a lighter gray.

The two j.n.d.'s thus determined represent the amount of variation there must be in saturation from the standard for the observer to appreciate a distinction between the standard and the variable with respect to saturation; or, in other words, the j.n.d.'s represent how much lighter or darker the gray of the variable must become to be distinguishable from the gray of the standard.

B. The Method of Average Error. In the Method of Average Error the stimuli are unequal, and the subject is asked to alter the variable stimulus in some way or another until he believes the two stimuli are the same. An appreciation of visual extents is measured in this way. The observer is asked to regulate one side of the Galton Bar so that the white space on that side approximates the



The Galton Bar has a millimeter scale on the rear side and a white enameled surface in front. The observer regulates the size of the white surface on one side by adjusting a black metal covering with the aid of a revolving rod.

(Reproduced by courtesy of the Marietta Apparatus Company.)

length of the white space on the other side, which is the standard. When he judges the variable to be identical to the space of the standard, he so states, and the recorder takes his reading from the scale. The subject is not informed of the results until the test is over. The right and left sides are used alternately as standards; and the experimenter makes the standard larger in one series and

smaller in another. The average of the readings represents the observer's conception of equality. This is called the point of "subjective equality." The average amount by which the observer misses the right measurement indicates his ability or lack of ability to judge visual extents with precision.

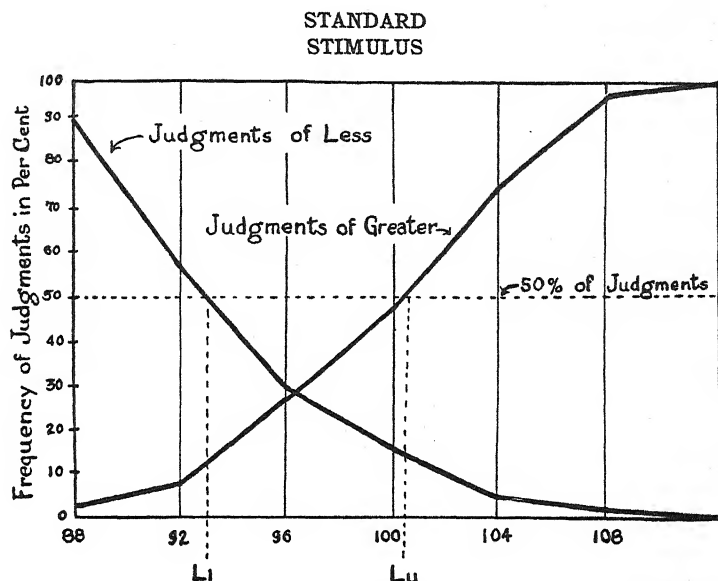
C. The Method of Constant Stimuli. This method uses a series of comparison stimuli, equal distances apart with respect to some characteristic. If we wish to determine the sensitivity of an observer to lifted weights, we use this method. In a lifted weights experiment, six weights are usually prepared, say, of 108, 104, 100, 96, 92, and 88 grams. The standard is presented first. The standard should be a little more than the average weight of the comparison stimuli, if a nearly equal number of "greater" and "less" judgments are to be obtained, since observers tend to depreciate the value of the first stimulus presented. In our case, therefore, a standard weight of 100 is used.

The observer lifts the standard weight and then the comparison weight. He judges whether the comparison weight seems greater, equal, or less in weight in relation to the standard. The comparison stimuli are presented in haphazard order to obviate the influence that expectation might exert on the observer's judgments. The experiment is conducted until the subject has compared each weight of the series with the standard 50 or 100 times.

The point on the scale of the comparison stimuli at which the observer gives responses of "greater" 50 per cent of the time is the j.n.d. for weights heavier than the standard, while the point on the scale of the comparison stimuli at which the observer gives responses of "less" 50 per cent of the time is the j.n.d. for weights lighter than the standard.¹ The respective j.n.d.'s may be roughly

¹See E. G. Boring, H. S. Langfeld, and H. P. Weld: *Psychology*, p. 55. 1935.

determined by plotting the distribution of the responses on a graph with the frequency of judgments in per cents on the ordinate (vertical) and the weights of the comparison



WEIGHT OF COMPARISON STIMULUS IN GM.

L_1 is the limen for weights lighter than the standard; L_u for weights heavier than the standard. In this particular case the "time error" accounts for the asymmetrical disposition of the two limens with respect to the standard. The "time error" is committed when the observer is influenced in his judgments by the temporal sequence of the standard stimulus and the comparison stimulus.

(The graph is adapted from E. G. Boring, H. S. Langfeld, and H. P. Weld: *Psychology*, p. 55.)

stimuli on the abscissa (horizontal).¹ For purposes of computation, the experimenter sometimes divides the "equal" responses, distributing half of them to the "greater" category and half of them to the "less" category.

¹For a more detailed description of the computations, see *ibid.*, pp. 55-56.

III. THE MEASUREMENT OF APTITUDES

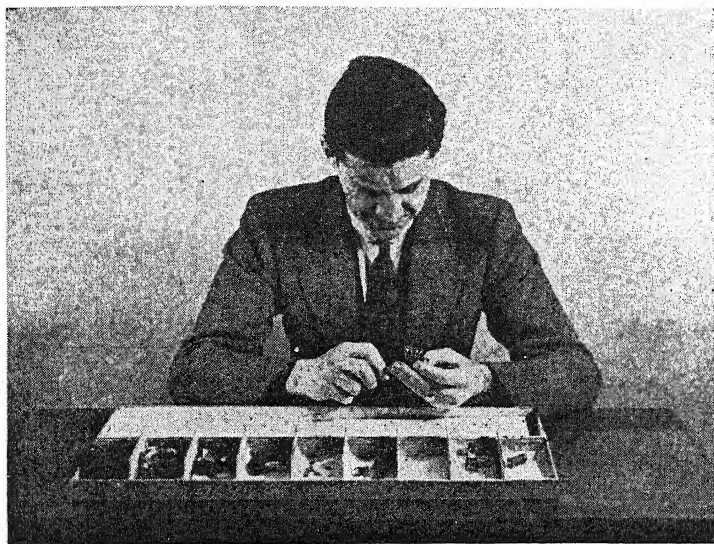
Some people seem to excel in a particular line of endeavor. Though not versatile in their capacities, they have a "gift" or knack for performing certain acts of skill with facility and finesse. Such persons are said to possess a special ability or aptitude. An aptitude is a condition or set of characteristics indicative of a person's ability to acquire with training some specialized knowledge or skill.¹

A. Mechanical Aptitude. Psychologists have devised tests which measure these skills with considerable accuracy. There are tests, for example, which measure *mechanical aptitude*. Manual dexterity, eye-hand coördination, and precision of movement are involved; and in addition, acquired skill, and cultivated interest in the handling of tools and machinery.

1. The Stenquist Test. The Stenquist Assembling Tests consist of a box divided into ten compartments. Each compartment contains a disjoined mechanical device, such as a bicycle bell or a mouse trap, which is to be assembled by the subject. The time required for putting the parts together is measured.

2. The Minnesota Test. The Stenquist Assembling Tests have been revised at the University of Minnesota. The Minnesota Assembling Tests retain some of the Stenquist Tests and several new ones have been added. The Assembling Test is just one of a battery of tests which make up the Minnesota Mechanical Ability Tests. The battery aims to measure *quality* of mechanical work as judged by experts, *quantity* of mechanical work when a given standard of excellence is maintained, *creativity* in mechanical work as demonstrated by devising new methods or by utilizing old methods in novel ways, and *critical appreciation* which involves good judgment of

¹See Bingham, *op. cit.*, pp. 16-17.



MINNESOTA MECHANICAL ASSEMBLY TEST

Various mechanical devices differing in complexity are presented to the subject for assembling. From left to right they are: (1) Corbin rim lock, (2) Bicycle bell, (3) Push-button doorbell, (4) Electric plug and wire, (5) Link chain, (6) Clothespin, (7) Razor, (8) Hose pinch clamp, and (9) Expansion bolt. The speed with which he completes the task of putting these devices together determines his rating on mechanical aptitude.

(By permission of Lowell S. Trowbridge.)

mechanical products and a keen interest in mechanical things.¹

B. Musical Aptitude. Another special aptitude that is now measured scientifically is *musical ability*. Time and money are often wasted in providing a musical education for persons whose capacities do not justify such intensive training. Frequently, individuals who have a real talent for music do not take music lessons because they are unaware, until it is too late, of their hidden aptitude. It is obvious that adequate tests for measuring musical talent

¹D. G. Paterson, R. M. Elliott, *et al.*: *Minnesota Mechanical Ability Tests*. 1930.

can prove invaluable in selecting those persons who merit a musical education.

Seashore has analyzed musical aptitude into its component skills, and has devised tests for measuring each one of them: the sense of pitch, the sense of consonance, the sense of rhythm, the sense of time, the sense of intensity, and tonal memory. The tests are presented by playing phonograph records prepared under Seashore's direction. The subject is instructed to listen for certain notes and to report his judgments.

In determining the *sense of pitch*, the subject is told that he will hear several pairs of tones, and that he is to judge whether the second tone of the pair is higher or lower in pitch than the first. In the *consonance test* the subject compares the consonance of the second of two pairs of dyads with the first. *Sense of rhythm* is tested by the presentation of pairs of rhythmic patterns, and the auditor must judge whether the second is the same as, or different from, the first. The *sense of time* test attempts to ascertain the minutest difference in time that can be perceived by a person. Three clicks are given which mark off two intervals of time. The second interval is judged with respect to the first. One hundred judgments of this sort are made. In the *sense of intensity* test the auditor listens to two tones and decides whether the second is more or less intense than the first. Two tonal sequences are sounded in the test for *tonal memory* and the subject is required to state which note of the second series differs from the first. The sequences have two, three, four, five, and six tones.¹

Though the Seashore Tests are subject to some serious

¹C. E. Seashore: *The Psychology of Musical Talent*. 1919.

See also *The Kwalwasser-Dykema Music Tests* published by the RCA Victor Company and Carl Fischer Company which measure discrimination in tonal memory and tonal quality; intensity; time; feeling for tonal movement; rhythm; pitch; melodic taste; and pitch imagery and rhythm imagery.

criticisms, they have been found to be of real value in the discovery of musical talent. Accomplishment records were kept of four successive entering classes at the Eastman School of Music. Students entering with a poor showing in the Seashore Tests have but one chance in five of ever graduating. The tests have proved of value in the choice of instruments. It is important that violinists, string and wind instrument players must rank high in pitch because they make their own tones. A student with poor tonal memory may be advised to study the organ, where he can have the music always in front of him.¹

C. Artistic Aptitude. Tests also have been standardized that measure *ability in the visual arts*. One of these



(Reproduced by courtesy of Norman C. Meier.)

tests is the Meier-Seashore Art Judgment Test, which consists of 125 pairs of pictures printed in phototone. The pictures of each pair differ in one respect only, in shading, heaviness of lines, balance, presence or absence of objects, and so forth. This difference is described on the record sheet given to the subject taking the test.

¹D. K. Antrim: "How Musical Are You?" *Reader's Digest*, January, 1937.

The problem is to decide which picture of each pair is the more pleasing, or more artistic, or more satisfying. If the left-hand picture is preferred, L is circled; if the right-hand, R is circled. The test determines one's ability to choose the kind of arrangement, shading, and the like, as judged to be the more artistic by authorities on art. Meier contends that this ability is indispensable to the artist. The high correlations obtained between success as an artist and scores on the test suggest that Meier's assertion is correct.

Tests such as we have just described are especially valuable for vocational guidance. The aim of the vocational counselor is to see that individuals are trained for the vocations particularly suited to their special aptitudes; with square pegs in square holes and round pegs in round holes, we shall be assured of more efficiency and more happiness.

IV. PERSONALITY TESTS

Personality is "the whole system of dynamic tendencies which differentiates one person from another."¹ The concept includes physique, temperament, intelligence, character, and the pattern of integration by which they are all organized into a working whole.²

Organized reaction patterns characterize the individual as he responds to others indicating whether he is friendly, benevolent, cruel, or pugnacious. The impressions he makes upon other people constitute his social effectiveness, as manifested in his quality of voice, his choice of language, his physical appearance, and his manners. The social qualities make up what is usually considered "personality."³

¹Bingham, *op. cit.*, p. 21.

²For a definition of *personality*, see G. W. Allport: *Personality: A Psychological Interpretation*, Chap. 2, "Defining Personality." 1937.

³See M. A. May: "The Foundations of Personality," Chap. 4, in *Psychology at Work*, P. S. Achilles, Editor. 1932.

Personality is described in terms of certain qualities. Thus we speak of a person as being sociable, or aggressive, or coöperative, or conscientious, or reliable, or resourceful, or stubborn. These qualities are sometimes referred to as *personality traits*. They are investigated by studying how the individual behaves in particular concrete situations, as usually represented by verbal means for paper and pencil tests. It must be noted, however, that people behave differently in different sorts of situations; for example, a man may be stubborn in his home relationships, but malleable in his club relationships. With this fact in mind, it is justifiable to use the term *trait* only with qualifications when we wish to describe the way in which the individual generally behaves in situations that involve the quality in question.

Traits are more inclusive and more enduring than habits. Traits are more generalized determining tendencies; habits more specific. A trait may be thought of, therefore, as an integration of a number of specific habits which share a common adaptive significance. Thus, the trait of cleanliness involves such habits as the habit of washing before meals, the habit of taking a bath, the habit of caring for the fingernails, the habit of shampooing the hair, and the habit of brushing the teeth.¹

Scientific psychology is interested in measuring the different aspects of personality with as much exactness as possible. Various methods have been devised for this purpose. Two methods in common use are the *rating scale* and the *questionnaire*.

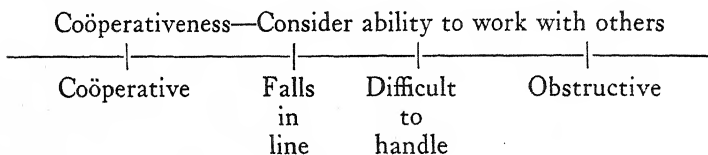
A. The Rating Scale. The rating scale as a method is related to two experimental methods: order of merit and paired comparisons. In the *order of merit* method, individuals are arranged in consecutive order from highest to lowest with respect to some trait, while in the method of

¹Allport, *op. cit.*, pp. 290ff.

paired comparisons each individual is compared separately twice over with the other members of the group, once as a standard, and once as a comparison stimulus. The number of preferences for each person determines his position in the final order of merit for the series.

1. Man-to-Man Rating Scale. Rating scales may be of several types. The Man-to-Man Rating Scale involves the selection of the five key men rating highest, high, middle, low, and lowest; and then all the other members of the group are rated with reference to them, a numerical plan being used.¹

2. The Graphic Rating Scale. The Graphic Rating Scale consists of a straight line representing the range of a trait. Brief descriptive terms are located along the line to indicate various degrees of the quality. The rater marks the line with a check to designate his estimate of the individual.²



3. The Percentage Rating Scale. The Percentage Rating Scale involves the rating of individuals on a percentage basis from 100 per cent (high degree of the quality) down to 10 per cent or lower (low degree of the quality). This method is in common use in the marking of ability as revealed on school examinations.

4. The Descriptive or Adjective Scale. The Descriptive or Adjective Scale is widely used by agencies which desire references concerning candidates applying for jobs.

¹W. D. Scott and R. C. Clothier: *Personnel Management*. 1923.

²M. A. Bills: "A Method for Classifying the Jobs and Rating the Efficiency of Clerical Workers," *Journal of Personnel Research*, 1923, 1, 384-393.

A prospective teacher, for example, may be rated on his ability to maintain discipline as "very poor," "poor," "medium," "good," or "excellent."¹

A rating scale in wide use is the Personality Rating Scale.² Five traits are to be rated on a graphic scale: appearance and manner, industry, ability to control others, emotional control, and distribution of time and energy. Space is provided for "behaviorgrams," that is, concrete instances to support the rater's judgment. Revision A is scored by checking along a straight line which is subdivided into ten sections. Revision B is scored by checking one of six alternatives.

Rating scales are subject to a number of serious criticisms which have been excellently summarized by Gordon Allport:

(1) Variables must be clearly defined. If the terms convey different meanings to different judges, the scale is worthless. It is a good idea, therefore, to give synonymous terms, such as *social intelligence—tact*, or to describe behavior illustrating the variable, such as "Do you feel self-conscious in the presence of superiors in the academic world?" (*submission*)

(2) The intervals on the scale must be neither too coarse nor too fine. It would be an invitation to error to require fine distinctions in making estimates of traits that are not suited to exact judgment.

(3) Judges require training. They should be given clear instructions, especially to make each rating an independent judgment unprejudiced by previous ratings.

(4) Variables are more reliably rated if they pertain to self-expression rather than to the inner life attitudes.

¹For an excellent presentation of these rating methods, see H. E. Garrett and M. R. Schneek: *Psychological Tests, Methods, and Results*, Part II, Chap. 3, "The Measurement of Personality and Temperament." 1933.

²Committee on Personality Measurement. Published by the American Council on Education, 744 Jackson Place, Washington, D. C.

(5) Some persons are more reliably rated than others. Introverted persons are the hardest for the judges to agree upon.

(6) Judges rate best those who are most like themselves.

(7) In self-rating there is a tendency to overestimate those qualities that are considered desirable and to underestimate the undesirable.

(8) Ratings tend to be complimentary, unless precautions are taken. The fallacy of generosity is found especially in the rating of friends.

(9) The "halo effect" prevents the giving of strictly independent judgments on separate variables. The general impression is apt to influence specific judgments and; conversely, some impressive specific observation may be the source of the general impression. For example, you may rate a person as unintelligent because you do not like him; or you may not like him because he likes to play bridge. Whenever the variables have a moral connotation, the halo effect is larger. Thus an individual may rate a man as dishonest in business because the subject is lax in his sexual morals.¹

B. The Questionnaire. The questionnaire method calls for a systematic report of the individual's attitudes and reaction patterns. The quantitative estimates of the rating scale are not involved. The questionnaire method has been employed to secure personal data with reference to feelings of inadequacy and other symptoms of maladjustment, to discover systematic interests people may have in sports, vocations, or social activities, and to reveal attitudes or convictions about social, economic, or religious issues. Since data of such a nature are not open to direct measurement, they may be conveniently investigated by the questionnaire method.

¹G. W. Allport: *Personality: A Psychological Interpretation*, pp. 436-447. 1937. By permission of Henry Holt and Company.

1. *Traits.* There are a number of personality inventories which have been widely used for the study of personal traits.¹ Woodworth's Personal Data Sheet aims to estimate psychoneurotic tendencies in terms of social and emotional inadequacies.² One hundred and sixteen questions are to be answered by Yes or No, such as:

Do you usually feel strong and well?
Were you shy with other boys?
Does it make you uneasy to go into a tunnel or subway?

The score is interpreted according to standardized norms.³ Ellen Mathews has revised Woodworth's test to measure emotional stability in children.⁴

Neymann and Kohlstedt have devised a Diagnostic Test for Introversion—Extroversion which consists of fifty statements to be answered by underlining Yes or No, such as:

Always be calm and collected.
Rewrite social letters.

Tendencies toward extroversion or introversion are revealed by whether the subject agrees or disagrees with the ideas expressed in the statements.⁵

A scale for Measuring Ascendancy—Submission in Personality has been designed by the Allports to "discover the disposition of an individual to dominate his fellows (or to

¹See G. W. Allport: *Personality: A Psychological Interpretation*, Chap. 12, "The Nature of Traits." 1937.

²Psychoneurotic tendencies are those tendencies which predispose a person to mental conflict and social maladjustment.

³R. S. Woodworth: *Personal Data Sheet*. 1917. The C. H. Stoelting Company.

⁴Ellen Mathews: *Revision of the Woodworth P. D. Sheet*. 1923. The C. H. Stoelting Company.

See E. Mathews: "A Study of Emotional Stability in Children," *Journal of Delinquency*, 1923, 8, 1-40.

⁵C. A. Neymann and K. D. Kohlstedt: *Diagnostic Test for Introversion—Extroversion*. 1928. The C. H. Stoelting Company. A manual is also procurable.

be dominated by them) in various face-to-face relationships of everyday life." Separate forms are available for men and women. Situations or problems are presented to which the subject indicates his reaction by checking one of the two to five alternatives provided.

Thus:

At church, a lecture, or entertainment, if you arrive after the program has commenced and find that there are people standing, but also that there are front seats available which might be secured without "piggishness" or discourtesy, but with considerable conspicuousness, do you take the seats?

habitually
occasionally
never

Numerical values are assigned the answers in the scoring. Norms have been established.¹

A more comprehensive test has been arranged by Bernreuter who has combined questions from Allport, Thurstone, Laird, and others in his *Personality Inventory*. The test is designed to measure neurotic tendencies, self-sufficiency, introversion—extroversion, dominance—submission, confidence in oneself, and sociability, which are scored on separate scales. The questions are to be answered by Yes, No, or ? (undecided).

Do you consider yourself a nervous person?

Are you much affected by the praise or blame of many people?

Would you rather work for yourself than carry out the program of a superior whom you respect?

Do you usually try to avoid dictatorial or "bossy" people?

Percentile norms have been established for each scale.²

¹G. W. Allport and F. H. Allport: *A Scale for Measuring Ascendancy—Submission in Personality (The A-S Reaction Study)*. By permission of and by arrangement with Houghton Mifflin Company.

²R. G. Bernreuter: *Manual for the Personality Inventory*. 1935. Stanford University Press, Palo Alto, California.

2. *Interests.* A person's interests reveal the nature of his personality and thus serve as a basis for prediction of his future educational and vocational pursuits and as an index of the life accomplishments in store for him. Various interest questionnaires have been devised, among which is Strong's Vocational Interest Blank. The subject indicates whether he likes (L), is indifferent to (I), or dislikes (D) various occupations, amusements, school subjects, certain kinds of people, and the like. The blank is scored separately for each occupation.¹ The blank has been filled out by several thousand persons following occupations chiefly on the professional level, such as lawyers, engineers, physicians, teachers, dentists, and architects. Most of the people who follow any one of these occupations tend to share similar interests, and their interest patterns, as revealed on the blanks, differ significantly from people in general. By weighing the responses of a given individual, it is possible to determine whether his interests coincide with those of men successfully engaged in any of the occupations with reference to which the blank has been standardized. An "A" rating means there is a high agreement with the interests of persons engaged in the occupation specified; a "B" rating means the person would perhaps like that particular sort of career; a "C" rating means definitely "No," for that occupation. The distribution of interest ratings among the different groups of occupations is as significant as the highest rating itself. The data obtained are valuable as a basis for a vocational interview.²

Brainard and Stewart have designed a Specific Interest

¹E. K. Strong: *Vocational Interest Blank*. 1927. Stanford University Press, Palo Alto, California. A manual can also be secured.

E. K. Strong: "Diagnostic Value of the Vocational Interest Test," *Educational Record*, 1929, 10, 59-68.

E. K. Strong: *Change of Interests with Age*. 1931.

²E. K. Strong: "Classification of Occupations by Interests," *Personnel Journal*, April, 1934.

Inventory for the discovery and analysis of interests, to serve as a basis for vocational guidance. The tests cover mechanical, literary, æsthetic, commercial, and other interests. The subject is asked:

How do you like—

To wrap parcels, cover or repair books, making neat folds.

Dislike	N.	Like
1	2	3
		4
		5

The final score is the sum of all the numbers circled. Subtotal scores are useful in the analysis of the various interests. The directions for interpreting the scores are given in a manual.¹

3. *Attitudes.* An individual's personality may also be understood in terms of his attitudes. An attitude may be defined as a readiness for a certain kind of reaction—a set or disposition which modifies or determines the nature of an experience. An attitude may be differentiated from a trait by the following criteria: (1) An attitude has a well-defined object of reference. Thus a person has an attitude toward divorce; a trait of conservatism. (2) An attitude may be specific or general; a trait is only general. (3) An attitude involves a definite attraction or repulsion for a stimulus; a trait has no such clear-cut direction.²

Opinions on religious and economic issues may be examined by Goodwin Watson's Test of Public Opinion. The purpose of the test is to show the extent and strength of the individual's prejudices. The different forms of the test deal with opinions on social, religious, and economic questions; the certainty of opinion on these issues; the extent to which the individual is willing to commit himself

¹F. J. Stewart and P. Brainard: *Specific Interest Inventory*. 1932. Psychological Corporation, 522 Fifth Ave., New York City.

D. Fryer: *The Measurement of Interests*. 1931.

²G. W. Allport: *Personality: A Psychological Interpretation*, pp. 293f. 1937.

on moot questions; and the subject's willingness to generalize his opinions on controversial issues. Extreme opinions, whether *pro* or *con*, are scored as evidences of prejudice. The gross total represents the general level of prejudice, and an analytic score indicates the direction of prejudice.¹

Thurstone and Chave have developed a test to reveal attitudes toward the Church, called Experimental Study of Attitudes toward the Church. Forty-five statements, ranging from statements very favorable to the Church to statements very unfavorable, give the subject an opportunity to indicate his sympathy or antagonism. Norms have been worked out for various groups such as college freshmen, divinity students, and non-churchgoers.²

Another test for measuring attitudes is A Study of Values, developed by Allport and Vernon.³ Part I consists of statements or questions with two alternative answers. Agreement and disagreement are checked numerically; "3" in the first column and "0" in the second column indicate a decided preference for the first alternative, while "2" in the first column and "1" in the second column indicate a slight preference for the first alternative. Thus:

7. In a paper such as the New York *Sunday Times*, are you more interested in the section on picture galleries and exhibitions than in the real estate sections and the account of the stock market?

(a) Yes; (b) No.

(a)

(b)

3

0

¹Goodwin Watson: *A Test of Public Opinion (A Survey of Public Opinion on Some Religious and Economic Issues)*. 1923. Bureau of Publications, Teachers College, Columbia University, New York. A manual is available.

Goodwin Watson: *The Measurement of Fair-Mindedness*. 1925.

²L. L. Thurstone and E. J. Chave: *Experimental Study of Attitudes toward the Church*. 1929. University of Chicago Press, Chicago, Illinois.

L. L. Thurstone and E. J. Chave: *The Measurement of Attitude*. 1929.

³G. W. Allport and P. E. Vernon: *A Study of Values*. 1931. Houghton Mifflin Company.

The answer indicates a decided preference for the section on picture galleries and exhibitions: aesthetic concerns are felt to be more important than economic concerns.

Part II of *A Study of Values* consists of situations or questions followed by four possible attitudes or answers. Preference is registered by writing the number:

- 1 . . . beside the answer that appeals to you most.
- 2 . . . beside the answer which is next most important to you.
- 3 . . . beside the next, and
- 4 . . . beside the answer that least represents your interest or preference.

Thus:

13. To what extent do the following famous persons interest or attract you—

2 a. Florence Nightingale
....

4 b. Napoleon
....

3 c. Henry Ford
....

1 d. Charles Darwin
....

The answers of the subject indicate his sentiments about the relative importance of various attitudes toward life. Various tests involve attitudes such as theoretical, economic, aesthetic, social, political, and religious. These six basic interests are found in varying degrees in every personality, according to Eduard Spranger, a German psychologist, who has described them in his *Types of Men* (1928).

The *theoretical* type is exemplified in the philosopher. His dominant value is truth, which he pursues without regard for consequences. He is often caricatured as the impractical idealist.

The *economic* type is devoted to utility, conceived

largely in terms of material things, such as the production of goods or the making of money. The business man who looks upon every friend as a prospect for a sale is a case in point.

The *aesthetic* type is illustrated by the artist who evaluates everything in terms of beauty. He is not interested in financial matters. His pleasures are more apt to be derived from sensuous gratification.

The *social* type devotes his energies to movements designed to improve the lot of the unfortunate. He is inclined to philanthropy. He enjoys doing a good turn for others.

The *religious* type may be the mystic contemplating the mysteries of the Infinite or the missionary traveling to foreign lands to minister to the heathen.

The *political* type wants power over others, and he will resort to any machinations within his lax code of honor to gain his ends. His dominant value is preferment in office. Leadership is his goal.¹

The relative importance of the different attitudes as measured by the Allport-Vernon Scale may be determined by a computation of the separate scores. The representation of the scores on a *profile* makes it easy to see at a glance the relations of the various interests in the individual's personality.

A *profile* represents the distribution of the scores of a test as they are plotted on a graph. The complete diagram is called a *psychograph*. It is a convenient way of describing the personality compactly in its various aspects. The profile is plotted as follows. The vertical scale represents the complete absence of a characteristic at the bottom and a gradual increase of the characteristic to the greatest amount at the top. The horizontal line in the middle represents the "average" between the ex-

¹See E. Spranger: *Lebensformen* (trans., *Types of Men*). 1928.

tremes. The traits in which the individual is superior to the average will be represented on the graph by the fact that the plotting line (scores) is above the average line, and the traits in which he is inferior will be represented below the median.¹ The following psychograph represents two individuals, A and B. (See facing page.)

If you were considering applicants for positions as salesmen in your organization, and you wanted an extroverted person superior in social intelligence, education, intelligence, self-sufficiency, dominance, sociability, and motivation, you would probably choose A in preference to B, in spite of the fact that A is self-conscious, for A has a much better chance of becoming a successful salesman.

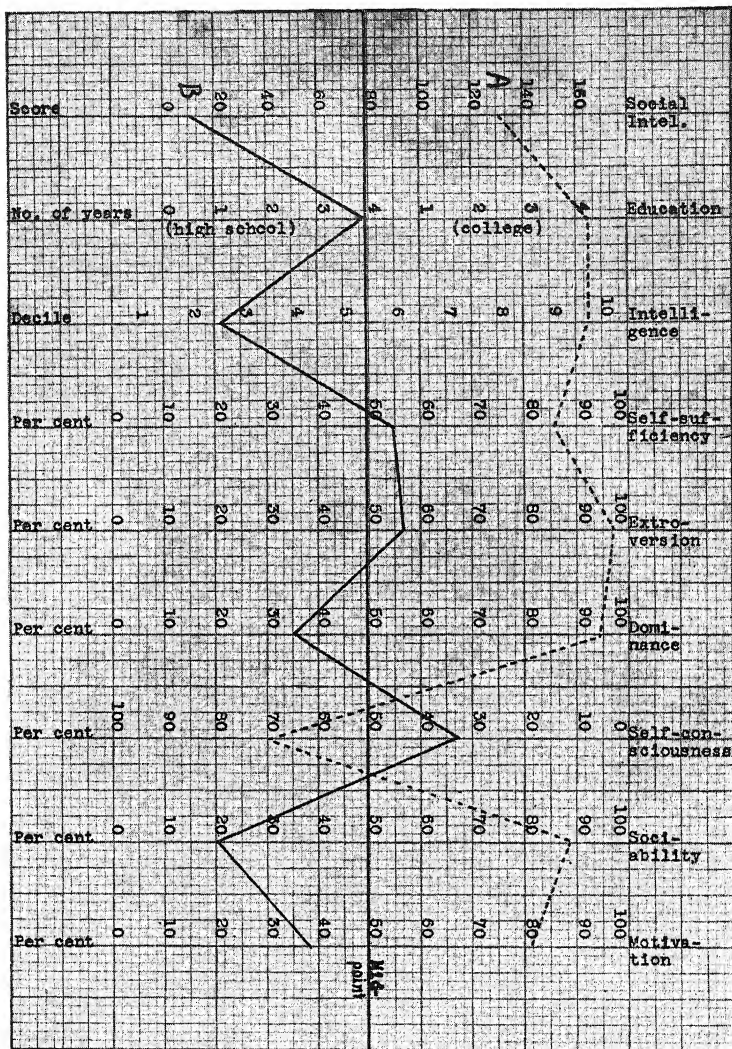
The psychograph is useful in personality evaluation. It makes it possible to compare scores computed in different units; it would be impossible to compare directly the number of years of education with the amount of self-consciousness. Then, too, the psychograph gives a convenient picture of the individual's relative development with respect to various functions. His superiorities and deficiencies become graphically apparent.

There are certain limitations which must be kept in mind when the graph is interpreted. These precautions are respected by the expert psychologist. For our purposes, we need not analyze them here.

The psychograph gives us a description of a person as he is. It does not tell us "how he got that way." An investigation into the genesis of the various traits is needed to render the psychographic method really effective in the analysis of personality.

There are certain weaknesses as well as advantages in the questionnaire method which must be kept in mind in

¹This description does not apply to a trait like extroversion where the extremes represent the limits of the range between extroversion and introversion rather than the limits of increase or decrease in the amount of the trait.



PSYCHOGRAPH: A AND B

evaluating the data secured by this technique. Ruckmick states the case judiciously. The weaknesses are:

(1) The procedure stresses explicit categorical answers, like "Yes" or "No," without qualifications or a specification of limiting conditions. If the person replying is an expert, he sees complicating factors that make it impossible to be categorical; if it is an immature person who gladly volunteers a categorical answer, the reply is untrustworthy. Investigators often insist on final answers so that they can classify them and treat them statistically without much effort. Questions are often so ambiguously worded as to be misleading.

(2) It is difficult so to frame a question as not to convey either a positive or a negative instruction. Leading questions may produce unreliable answers.

(3) Investigators do not bother to go beyond the categorical replies in tabulating the results. The *Aufgabe* for tabulation is likely to mean a disregard for the variable circumstances surrounding the replies.

(4) Statistical treatment is apt to give the results more prestige than they deserve. No matter how accurate the statistical computations, the resulting interpretation is no sounder than the origins of the data.

(5) The significance of unreturned questionnaires and of unanswered items is apt to be overlooked. Failure to reply may or may not mean a negative answer. Certainly it is unsafe to assume that one half of the unreturned questionnaires should be regarded as positive and one half negative, thus canceling each other out in a convenient fashion. The mortality of questionnaires is almost always high, thus affecting the results seriously.

The advantages are:

(1) The method saves time and thus promotes the opportunity for covering more ground. Scope is sometimes more important than accuracy of detail.

(2) The questionnaire furnishes cues for further investigation.

(3) The very formulation of questions, if it is thoroughly done, provides a deeper insight into the nature of the problem.

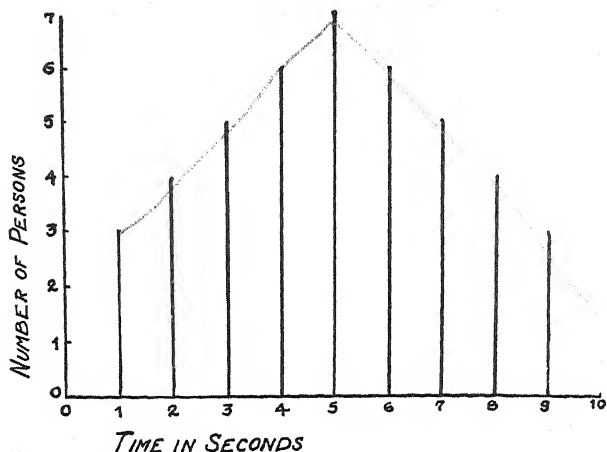
In summary, the questionnaire method has certain values which may be capitalized to advantage if the abuses are scrupulously avoided. The technique should be regarded merely as antecedent to, and dependent upon, further experimental research.¹

V. STATISTICAL TREATMENT OF DATA

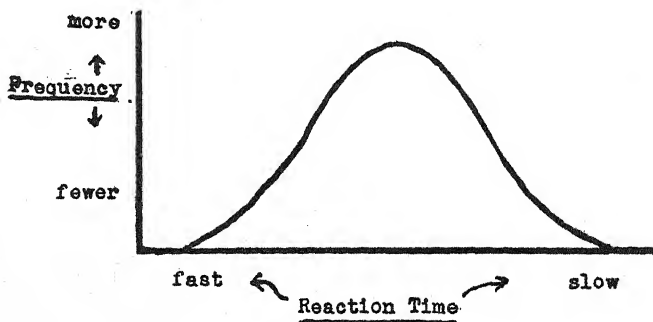
We have described the various methods by means of which scientific psychology measures the different aspects of mind and behavior. The interpretation of the data obtained by experimental investigation depends upon a mathematical treatment of the figures that measurement has yielded. This is the function of statistics. It is sufficient for our purposes to limit ourselves to a brief survey of the fundamental factors involved in the application of statistical methods.

A. The Distribution Curve. Suppose we measure the reaction times of a large number of people. We find that a few people are very fast, a few people are very slow, and most people are neither fast nor slow but fall somewhere in between the extremes. Suppose that in a free-association test 3 persons respond to the stimulus word *money* in 1 second, 4 in 2 seconds, 5 in 3 seconds, 6 in 4 seconds, 7 in 5 seconds, 6 in 6 seconds, and 5 in 7 seconds, 4 in 8 seconds, and 3 in 9 seconds. We may plot the scores as follows on a bar graph:

¹C. A. Ruckmick: "The Uses and Abuses of the Questionnaire Procedure," *Journal of Applied Psychology*, 1930, 14, 32-41.

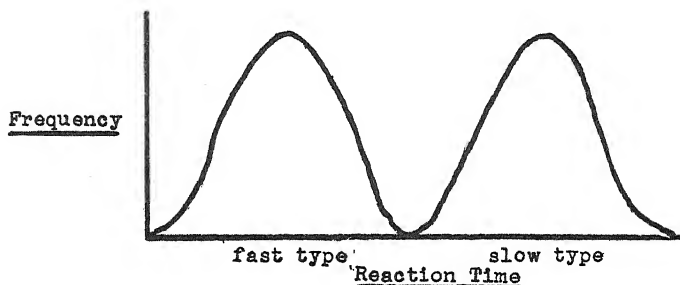


By connecting the tops of each bar we get a curve, known as the *distribution* or *frequency curve*, which represents the range of individual differences involved in this particular case. If we assume that the distribution is uniform, we have a “normal curve” like the following, on which the amount of time required for reaction is plotted along the horizontal line and frequency (number of individuals) along the vertical line.



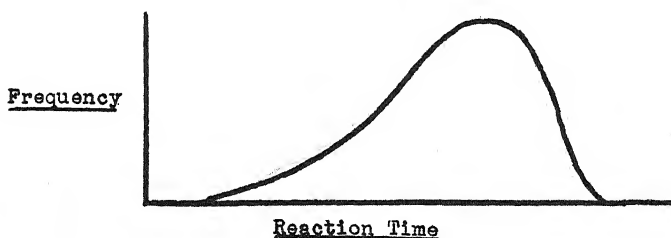
In everyday thinking, we often describe some people as fast and other people as slow. In other words, we classify

people into two types, the fast and the slow. If there were such types, the curve would look like this:



Since no such curve is obtained by actual investigation, we are forced to conclude that people do not fall into discrete types. Instead, people taken *en masse* range by gradual steps or degrees from fast through average to slow.

In actual practice the normal curve is only approximated. Sometimes the curve is *skewed*. Thus:



This means, in this case, that more people in the group under investigation tend to be slow than there are those who tend to be fast. Accurate interpretation, therefore, involves some analysis.

1. The Central Tendency. The central tendency in our case represents the grouping of the majority of the people toward fastness or slowness. It is analyzed in terms of the *mean*, the *mode*, and the *median*.

a. The mean. The *mean* is determined by adding the

reaction times of all the people tested, and then dividing this total by the number of people involved. Thus:¹

A	. . .	takes 3 seconds to react to a stimulus
B	. . .	" 4 " " " " "
C	. . .	" 5 " " " " "
D	. . .	" 6 " " " " "
E	. . .	" 7 " " " " "

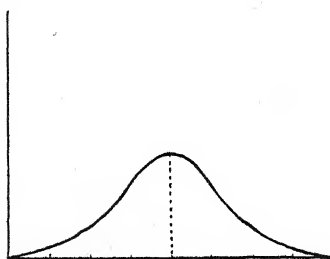
The total time in seconds is 25. Divide this by 5 (the number of people). The resulting figure, 5, is the mean.

b. The mode. The *mode* is the area on the curve where the largest number of people is grouped. Thus:

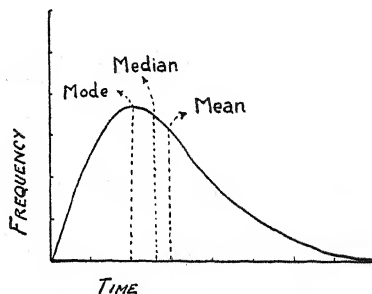
A	. . .	3 seconds
B	. . .	4 "
C	. . .	5 "
D	. . .	6 "
E	. . .	6 "
F	. . .	6 "
G	. . .	7 "

In this case, 6 is the mode. When the curve is skewed, the mode differs from the mean, as in the above sample.

c. The median. The *median* is the line drawn vertically through the distribution curve in such a position that one



The *Mode*, *Median* and *Mean*, represented by the dotted line, are the same for the normal curve.



The *Mode*, *Median*, and *Mean* differ for the skewed curve.

¹We are taking a small group for the sake of simplicity. In actual practice, larger groups are necessary to get significant conclusions.

half of the cases will fall on one side of it and one half of the cases will fall on the other side of it.

2. Variability. At times it is necessary to determine the amounts by which people differ, so that we must proceed beyond the mere computation of the central tendency. The central tendency represents the *center* of distribution. The amount of *scatter* is computed in terms of *deviation*. The *average deviation* (A.D.) is computed by calculating the distances of all the individuals from the average, adding up these deviations and dividing by the number of people. Thus:

A	2 seconds
B	4 "
C	4 "
D	7 "
E	7 "
F	8 "
G	10 "

The average in this case is $\frac{42}{7}$ or 6. The average deviation is derived by computing how much each individual's score differs from the average of 6, adding the amounts of deviation, and dividing the total by the number of cases. Thus:

Average	Score on reaction time test	Deviation (d)
6	2 (A)	4
6	4 (B)	2
6	4 (C)	2
6	7 (D)	1
6	7 (E)	1
6	8 (F)	2
6	10 (G)	4

The sum of the deviations is 16. The A.D. is 16 divided by 7 (the number of cases) or 2.29. Where the scatter is more extensive than in our illustration, the A.D. sheds important light on the nature of the distribution. For

accurate computation, the *standard deviation* (S.D.) is used rather than the A.D., for reasons which do not concern us here. The S.D. is obtained by squaring each individual deviation, then adding them, dividing by the number of cases and finally extracting the square root. The theory underlying these computations is highly technical in nature.

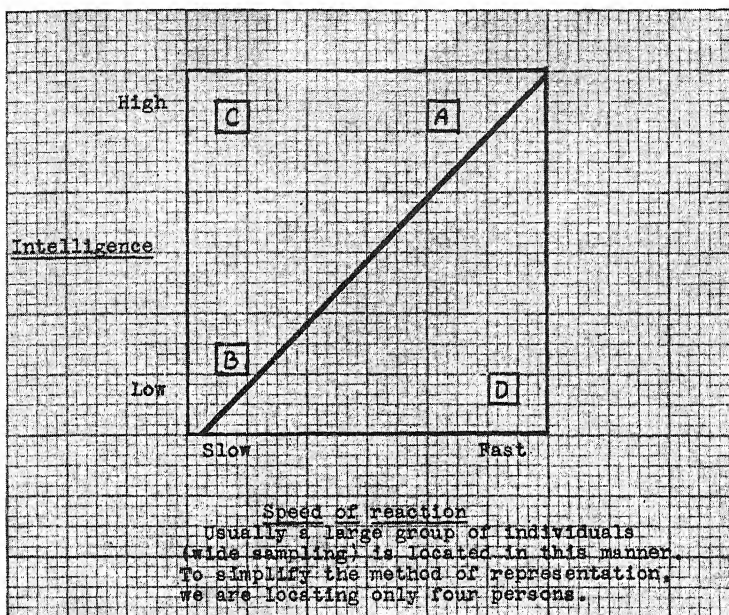
Scatter is often represented conveniently on a *scattergram* in cases where people are measured with respect to two functions. We shall explain how this is done in connection with correlation.

B. Correlation. Let us suppose that the individuals we are investigating are given, in addition to the test in reaction time, a test on intelligence. It will be of interest to determine how the scores attained in the one test correspond to the scores attained in the second test. This relationship is measured by means of *correlation*. Thus we will be able to answer the question as to whether the same individuals make high scores in both speed and intelligence (in which case speed is probably a factor in intelligence), or whether individuals who are slow are the high scorers in the test of intelligence.

An exact representation of the relative standing of each individual on the two tests may be accomplished by means of a scattergram like the one on the next page. A fast person will be located to the right of the diagram and a slow person to the left. An intelligent person will be located near the top of the diagram and a stupid person near the bottom. One cross will locate a person with respect to both scores. The diagonal represents the central tendency. Interpreting our scattergram, we see that:

A is fast and intelligent. B is slow and stupid. C is slow and intelligent. D is fast and stupid.

1. Coefficient of Correlation. The correlation chart or scattergram gives us only a rough picture of the relation-



ship between speed and intelligence. A more accurate answer to our question can be secured by computing the *coefficient of correlation*. If the fast are intelligent and the slow are stupid, and this distribution is uniform all along the line, the correlation is perfect. It is 100 per cent, represented in practice by $+1.00$. If the fast are stupid and the slow are intelligent, and this distribution is uniform all along the line, the coefficient is represented by -1.00 . If the fast and slow fall in a uniform fashion on both sides of the average intelligence, the coefficient is represented by 0. Correlation may thus range from $+1.00$ through 0 to -1.00 . Actually, a $+1.00$ or -1.00 correlation is practically never obtained. A coefficient of about .30 is usually considered to be significant.

Let us take a simple example to illustrate how the coefficient of correlation is obtained. The individuals

under investigation are ranked in their order of achievement on the two tests. Thus:

	<i>Speed</i>	<i>Intelligence</i>
A	1	2
B	2	3
C	3	1
D	4	5
E	5	4
F	6	6

The following formula worked out by Spearman may be used.

$$\rho = 1 - \frac{6 \sum (d^2)}{n (n^2 - 1)}$$

ρ : coefficient

Σ : sum of

d : deviation (difference in rank order between the two scales)

n : number of cases

Computation is carried out thus:

	<i>Speed</i>	<i>Intelligence</i>	d	d^2
A	1	2	1	1
B	2	3	1	1
C	3	1	2	4
D	4	5	1	1
E	5	4	1	1
F	6	6	0	0

The sum of the d^2 's is 8. Therefore,

$$\rho = 1 - \frac{6 \times 8}{6 (36 - 1)}$$

$$\rho = 1 - \frac{48}{210}$$

$$\rho = 1 - .23$$

$\rho = +.77$, which means that there is a considerable tendency for the fast to be intelligent and the slow to be stupid, in our particular sample.

The Method of Rank Differences, which has been developed by Spearman, may be used with groups of thirty or forty. It is apt to be somewhat inaccurate, since it takes account of relative position only. For example, suppose A, B, C react 1, 2, 3 with reference to speed. A takes 1 second; B takes 2 seconds; C takes 5 seconds. The differences in rank are seen to be unequal. For greater accuracy, therefore, the Product Moment Method of Pearson, which correlates actual scores, is used.

2. Probable Error. In order to be sure that the coefficient of correlation between two tests is significant, the *probable error* must be computed. The extent of this error indicates the probability as to whether nearly the same coefficient of correlation will be obtained if the same tests are administered to another group under identical conditions, or to the same group under identical conditions at another time.

3. Reliability and Validity. A test is *reliable* if an individual obtains approximately the same score upon taking the same test at another time, or if he obtains equivalent scores on equivalent tests. A thoroughly reliable test should correlate as high as $+ .90$ or above.

A test is *valid* if it measures what it is designed to measure. Thus a test for salesmanship is valid if the persons who score high on the test succeed in selling, whereas those who score low on the test fail in selling. Success in the activity for which the test is planned is taken as the *criterion* against which the test must be checked. If the test is valid, it will have a high correlation with the particular criterion chosen.

Exercises are supplied in the Workbook,¹ to provide practice in the application of the various statistical methods.

¹W. F. Vaughan and J. G. Needham: *Students' Manual for General Psychology*. 1939.

Formulæ are supplied, with an explanation of how they are to be used.

SUMMARY

Measurement of motor abilities is made by means of tapping, steadiness, dexterity and other tests; measurement of perceptual capacities, by means of the methods of limits, average error, and constant stimuli. Among the aptitudes that can be measured are the mechanical, the musical, and the artistic.

Personality tests are made by using rating scales and questionnaires. These devices enable the psychologist to measure traits, interests, and attitudes.

The scientific approach to psychology has resulted in the evolution of exact methods for measuring the data discovered by painstaking investigation. Improvements in experimental technique are being steadily introduced. Statistical treatment of the data derived from experimentation is becoming gradually more extensive. Psychology is no longer a matter of theoretical guesswork; it has become an exact science.

PERSONALITY AND SOCIAL LIVING

TEXTBOOKS ON GENERAL PSYCHOLOGY often allot disproportionate space to reports on laboratory investigations of technical and detailed topics; consequently, the student may not obtain an adequate understanding of the great importance of broad social situations as they determine human behavior. To counteract this tendency to deal with isolated psychological topics and with man in general as a scientific abstraction, we shall complete our study of human nature by observing how people adjust themselves more or less successfully to their fellow beings. A lifelike picture of the human personality must depict the individual in his social setting. With this thought in mind, we shall turn our attention to some of the problems of social adjustment.

I. INDIVIDUAL DIFFERENCES

Getting along with people depends, to a large extent, upon our understanding of human nature in general, but more especially upon our insight into the particular nature of particular individuals, for no two persons are exactly alike. The appreciation of individual differences is a fundamental prerequisite to social adaptation.

A general formula for influencing people may, nevertheless, still have some value, especially if it is used with the realization that it is not going to apply to everybody with exactly the same degree of effectiveness, that, indeed,

there will be some people with whom it will not succeed at all. Rules for guiding adjustment are useful if their limitations are kept in mind, that is, if the fact of variability is not glossed over in a desire to save effort by simplifying matters. A general rule for controlling the behavior of others may work, simply because people are enough alike so that the rule applies to a large number of them. Elmer Wheeler, for example, has discovered and patented "Tested Selling Sentences" that help to sell merchandise. An unschooled soda jerker asks whether you'll have an egg in your malted milk, and almost automatically your answer will be "No." An attendant trained by Wheeler holds up an egg in each hand and asks whether you'd like one egg or two, and almost automatically you will answer "One." Such is the art of suggestion—to supply the stimulus that calls forth the desired response. Wheeler advises: Don't ask *if*. Ask *which*. Don't ever give the customer the choice between something or nothing. Don't ask questions that can be easily answered in the negative.

Instead of asking patrons whether they wanted a large or a small Coca Cola, Wheeler proposed the clerks say "Large one?" and a large one it was two out of five times.

Engaged by the Barbasol Company, Wheeler set up his "field word laboratory" in a retail store. He found the clerks were using 146 different sentences to interest men shoppers in Barbasol. By trial and error he arrived at one sentence, "How would you like to save six minutes shaving?" Sales doubled. Later he simplified this sentence to, "How would you like to cut your shaving time in half?" Sales tripled.

"It gets them in the corners" disposed of square fly swatters. "It won't rub off" increased sales of white shoe polish by 300 per cent. "Have you ever used a *scientific* tooth brush?" sold out a several months' supply in one week.

For the Statler Hotels, he coached room clerks to quote prices "from \$6 down" instead of "from \$3.50 up."

Wheeler, of course, does not expect his "Sentences" to appeal to every prospective customer. His aim is to hit the majority in terms of their common reaction tendencies.¹

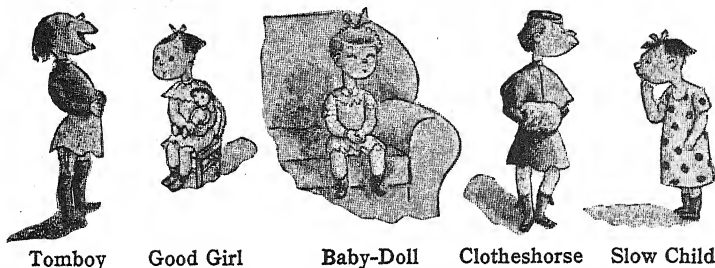
It is true, also, that a classification of individuals into types does not accord with the evidence garnered through distribution curves, that typologies place boundaries where boundaries do not belong, and that individuality is obscured by the coarse pigeon-holing of people. Nevertheless, again, there is a pragmatic justification for using a psychology of types, provided we remind ourselves constantly of its artificiality. We must understand that the term type merely represents the fact that certain people resemble each other in some respect or respects. We must appreciate the fact, too, that if we consider individuals in more than one respect, we shall find any given individual will belong to a number of uncoordinated types. He may be a tyrant, a snob, a nature lover, and an antique collector, but that does not mean that all tyrants are snobs, nature lovers, and antique collectors. Further, we must realize that nobody is always a tyrant in all situations and that people do not fall by a bimodal distribution into tyrants and non-tyrants. If we keep all of these qualifications in mind, we may resort to typology without serious error and find it of considerable value in understanding people.²

We may, for example, recognize the types of persons represented by Steig in the drawings at the top of the next page. The pictures are approximations to some people we have known.

A class orator, speaking at a Yale Commencement,

¹See *The Literary Digest*, January 22, 1938.

²For a defense of the theory of types of personality see Gardner Murphy and Friedrich Jensen: *Approaches to Personality*, Chap. 1, "Gestalt and Type." 1932.



Tomboy

Good Girl

Baby-Doll

Clotheshorse

Slow Child

SMALL FRY—LITTLE WOMEN

(Reproduced by courtesy of William Steig and *The New Yorker*.)

described certain types of undergraduates, which may be found, with variations, on any campus:

First of all, Mr. "I-Am-Intellectual" comes strolling culturally by. He finds joy in disclosing to his classmates the admirable results of a deep insight into music, art, literature. He frames his thoughts in obscure metaphor, wherewith he delights to puzzle the uncouth brain. When asked to elucidate, he declares that one can't explain the higher appreciations of life. One just knows. He lolls contentedly in the sunshine of his own light-giving brain. He skims the cream from the pitcher of knowledge and flicks it gently in our faces.

Next, Mr. "They-say-I'm-an-Athlete" rolls blushing into view. He has spent his great strength for Yale. He has suffered untold physical rack for the honor of the blue. Then he modestly tucks his "Y" in a bureau drawer, takes his seat in a big morris chair, and reminisces about No. 34, 6, the play by which he made a touchdown against V —. He gives his heart's blood, not his brains, to Yale's friendships and problems.

The comparative peace and quiet of this scene is suddenly shattered. Mr. "I'm-an-Awful-Busy-Big-Man" comes rushing frantically along the walk. He must hurry to place his shoulder against Connecticut Hall lest the whole University come crashing to the ground. Between gasps for breath he speaks to every one by first name. He has shown great ability to solve Yale's vital problems. Yet he has been so busy showing it, he has scarce had time to use it.

But, ah! Sanity is soon restored, for who should come lolling nonchalantly along the way but Mr. "Chuckle-Chuckle-

I'm-Just-a-D—good-Guy.” He is going nowhere for no conceivable reason. After he gets there, he will converse with anyone, for any length of time, about nothing whatsoever. His entire interest is absorbed in discovering the most systematic method of wasting time. He can be forced to think only by the accusation that he once did so.

And now, walking slowly but firmly, his chest thrown out, his nose pointing at Orion, comes Mr. “You-don’t-know-me-and-I-don’t-give-a-hang.” He is popularly known as the great unwashed. When spoken to by Mr. “Big-Man,” he replies nothing—vocally. Mentally he records, “You won’t get my vote. I won’t even cast one.” Having been unjustly relegated to the ranks of the unnoticed, he takes pleasure in failing to recognize those who he feels have been unjustly accorded recognition.

Every foible which we have observed in our classmates is recognized only by a corresponding weakness in ourselves. These five caricatures are, in fact, inspired by an instinctive conviction that we have lost something which our ridiculed classmates have gained. We wish that we too might enjoy that familiarity with books and their content which our “brainy” friend can boast, that we might possess that confidence which comes to the “athlete” from the knowledge of having thrived on punishment, a discipline of disposition which sustained and concentrated effort has given the “busy man,” an ability to enjoy the trivial which has come to the “conscientious loafer.” And had we but sat in Yale’s window seat with the great masses of the “unnoticed” and watched the Yale parade roll by, we too might have gained a power of discrimination between things superficial and things real, a faculty which may bring increasing success as time goes on.¹

Notice that the speaker is fully aware that his types represent forms of behavior shared to different degrees by all of his classmates. Thus he recognizes that most people belong, not to opposite extremes, but to a “mixed type” incorporating reactions pointed in both directions, such as working and loafing. Those persons who approximate

¹A. C. Robertson, at Yale Commencement, 1928.



the "pure type" must be regarded as extreme deviations from the norm, rare and atypical rather than typical.

Jung's classification of people¹ into introverts and extroverts was initiated by his observations of the pathological individual with the shut-in personality of schizophrenia.² Then individuals not definitely abnormal were noted who approximated this introvert type. The extrovert came to be defined chiefly in contrast to the introvert, without recourse to pathology. Freyd has listed the characteristic behavior patterns of the introvert (the extrovert would be opposite in each case):

1. Blushes frequently; is self-conscious.
2. Avoids all occasions for talking before crowds; finds it difficult to express himself in public.
3. Prefers to work alone rather than with people; prefers to work at tasks that do not bring him into contact with people.
4. Dislikes and avoids any process of selling or persuading anyone to adopt a certain point of view (except in the religious field).
5. Takes up work which requires painstaking and delicate manipulation.
6. Hesitates in making decisions on ordinary questions that arise in the course of the day.
7. Introspects; turns his attention inward.
8. Depreciates his own abilities, but assumes an outward air of conceit.
9. Is critical of others.
10. Is extremely careful about the friends he makes; must know a person pretty thoroughly before he calls him a friend.
11. Limits his acquaintance to a select few. (This may be beyond his control.)
12. Has ups and downs in mood without apparent cause.
13. Has ups and downs in mood with apparent cause.
14. Works by fits and starts.
15. Worries over possible misfortunes.

¹C. G. Jung: *Psychological Types*. 1923.

²Schizophrenia is a mental disorder in which the patient lives in the world of his own hallucinations and delusions, no longer concerned with the world of reality.

16. Feels hurt readily; apparently sensitive about remarks or actions which have reference to himself.
17. Is outspoken; says what he considers the truth regardless of how others may take it.
18. Keeps in the background on social occasions; avoids leadership at social affairs and entertainments.
19. Is absent-minded.
20. Is reticent and retiring; does not talk spontaneously.
21. Shrinks when facing a crisis.
22. Prefers to work things out on his own hook; hesitates to accept or give aid.
23. Is meticulous; is extremely conservative about his dress and painstaking about his personal property.
24. Prefers participation in competitive intellectual amusements to athletic games.
25. Is a poor loser; considerably upset and indisposed after the loss of a competitive game.
26. Makes mistakes in judging the character and ability of others.
27. If he unburdens at all, he does so only to close personal friends and relatives.
28. Indulges in self-pity when things go wrong.
29. Daydreams.
30. Limits his acquaintances to members of his own sex.
31. Is persistent in his beliefs and attitudes.
32. Shrinks from actions which demand initiative and "nerve."
33. Gets rattled easily; loses his head in excitement or moments of stress.
34. Expresses himself better in writing than in speech.
35. Is governed by reason rather than by impulse or emotion; is a good rationalizer.
36. Derives enjoyment from writing about himself.
37. Is thrifty and careful about making loans.
38. Is conscientious.
39. Resists discipline and orders.
40. Admires perfection of form in literature.
41. Is sentimental.
42. Rewrites his social letters before mailing them.
43. Pays serious attention to rumors.
44. Believes in "mind" cures; accepts an idealistic philosophy.
45. Talks to himself.

46. Keeps a diary.
47. Is strongly motivated by praise.
48. Is selfish.
49. Is slow in movement.
50. Prefers to read of a thing rather than experience it.
51. Is suspicious of the motives of others.
52. Is effeminate (if a man).
53. Is a radical; wants to change the world instead of adjusting himself to it.
54. Is creative of new and sometimes eccentric ideas and things.¹

ambiverts
Most people, it has been found, are ambiverts, that is, they are a "mixed type," combining in some sort of balance the extrovert and introvert characteristics. Despite the objection that introverts and extroverts are artifacts, that in reality they do not exist, the descriptions of these so-called types provide valuable insight into different forms of human behavior.²

Menninger describes types of people who are predisposed to failure because they cannot bear up under the strain of adapting themselves to unusual difficulties.³ The following types are delineated:

1. *Organic disease type—crippled personalities.*

A person with chronic heart disease looks at life differently from the normal person. So do persons suffering from tuberculosis, thyroid excess or deficiency, or deafness.

2. *Hypophrenic type—stupid personalities.*

Feeble-minded individuals can succeed only under unusually favorable conditions. Institutional care is frequently imperative.

¹Max Freyd: "Introverts and Extroverts," *Psychological Review*, 1924, 31, 74-75; 78-79; and 84-87.

²See B. M. Hinkle: *The Re-Creating of the Individual; a Study of Psychological Types and Their Relation to Psychoanalysis*, especially Chap. 5, "A Study of Psychological Types." 1923.

³Reprinted from *The Human Mind* by Karl Menninger, by permission of and special arrangement with Alfred A. Knopf, Inc., authorized publishers.

3. *Isolation type—lonely personalities.*

Persons geographically isolated, snobs, and only children are often inclined to be seclusive because of social failure.

4. *Schizoid type—queer personalities.*

These persons suffer from a queer sort of queerness. They are apt to be silent, sensitive, shy, and egotistical. They may be respected but they are never loved very much because they refuse to let people know them intimately. This type is broken down into more specific varieties: the seclusive, the hard-boiled, the artistic, the grouchy, the radical, and the suspicious.

5. *Cycloid type—moody personalities.*

These persons get gloomy or elated, irrespective of circumstances. Their ideas are dictated by their feelings. They often fail because they are depressed or they are depressed because they fail. It is a vicious circle.

6. *Neurotic type—frustrated personalities.*

These individuals find it difficult to modify their primitive urges to meet social demands. Their confused lives leave them feeling thwarted.

7. *Anti-social type—perverse personalities.*

In this group are included tramps, hoboes, vagabonds, gypsies, and ne'er-do-wells.

Menninger feels that this description of types of people who fail in life is helpful in understanding both normal and abnormal people.

In dealing with people it is impossible for us, with our limited mental capacities, to keep constantly in mind the infinite gradations of human variability. Yet classifying people according to types, or stereotypes, helps us in understanding them, even though no such sharply defined categories exist. We must recognize that an observer like Lin Yutang is grossly oversimplifying when he says, "The American is known as a great hustler, as the Chinese is

known as a great loafer.”¹ Certainly not all Chinese loaf. Americans differ more from each other on the hustling-loafing scale than they differ from the Chinese, who also exhibit extensive variations among themselves with respect to bustling about or “taking things easy.” As long as we do not grow careless in coming to think of all Scotchmen as being stingy, or of all fat people as being cheerful, or of all introverts as being identical just because we call them “introverts,” resort to the psychology of types may be justified.

It is well to remember, though, that variability among human beings is the rule. The scale of variability parallels zoological rank. One amoeba, one starfish, one mosquito, or one tadpole is about like another. Goldfish vary more, dogs still more, and human beings exceedingly more. Functional traits like strength and speed are more variable than structural ones like the size of organs. Recently acquired abilities, both in the individual and in the race, are more variable than ancient, long-established ones: talking varies more than walking. We differ more in musical perception than in hearing, more in aesthetic taste than in vision, more in athletic skills than in the simple use of the hands in grasping. Variation is the keynote of the design for more intelligent living.²

One of the great tasks we have to face, as human beings, is the problem of social adjustment. We have to learn how to adapt ourselves to the demands of our associates and we have to master the art of encouraging our fellows to adjust themselves to our peculiar needs. It is the part of wisdom, therefore, to study individual differences and to heed the existence of the personal equation in our everyday relations. An honest regard for each individual will promote both tolerance and understanding.

¹Lin Yutang: *The Importance of Living*, p. 148. 1937.

²Joseph Jastrow: “The Skyline of Humanity,” *Esquire*, January, 1937.

II. THE DEVELOPMENT OF CHARACTER

Character is an ethical concept with reference to which personality is given a moral evaluation. Every individual has to learn to regulate his behavior so that it will measure up to prevailing social and ethical standards. We are dealing with personality as character when we judge how well a person has succeeded in meeting the demands of a social code. It is character that sustains effort in the face of obstacles, that works for remote ends considered more worth while than more immediate ones, that gives stability and dependability to the personality.¹

Weakness of character results from the habitual avoidance of the distasteful tasks of life and the habitual shirking of responsibility. A strong habit is built up against the performance of duty. A student once remarked that his college teachers were softening his fiber and unfitting him for his business career by excusing him from this and from that assignment on the slightest grounds, instead of imposing a stern discipline. The college student can shirk his duties and often get away with it by playing upon the sympathy of his teacher. He gets lazy and lax without paying the penalty—while he is in college. In spite of all the hullabaloo about the importance of character, educators frequently do not make an effort to discover the small ways in which big issues are gradually determined. A coach would never tolerate in his charges the shirking habits that are encouraged day after day in the classroom. That same student confided, "I wish you Profs would be just as hard on us as our boss is going to be later on. Otherwise, we're going to find the going hard."

In one of his speeches, Dr. Glenn Frank, former president of the University of Wisconsin, said: "I do not covet

¹G. W. Allport: *Personality: A Psychological Interpretation*, pp. 51-53. 1937.

for my sons any brilliance, any magnetism, any striking personal attributes that will open all doors to them at a touch. I covet for them hard jaws and firm muscles, the capacity to stay with their work an hour longer than the other fellow, and to hold on when more brilliant men have decided the thing is too slow and have quit." A strong character, such as Frank covets for his sons, is achieved only by the cultivation of a tenacity of purpose in the small assignments of everyday life. A firm character is the outgrowth of an arduous training in which habits of firmness are resolutely developed.

Will is character in action. The will is a man's total personality as it is represented in his conduct. If a person continually acts against the dictates of his better judgment, and then continually regrets his actions, he will be cursed with a weak will. If a person persistently acts in accordance with his ideals (what he considers valuable), and refuses to swerve from the path of resolution, he will be blessed with a strong will. Will is not something which operates independently of our habitual modes of conduct. Aristotle pointed out, long ago, that a man is not really moral until he is good without having to think about it.

Character is concerned with values. A man's conscience is his system of moral values. Now since the sense of guilt is a fundamental factor in unhappiness and mental disorder, it is extremely important that a child's moral training be wholesome. Wrong ideas on ethical issues may prove seriously detrimental to mental health.

The Character Education Inquiry under the leadership of Hartshorne, May, Maller, and Shuttleworth investigated the moral ideas and practices among children.¹ In planning their tests, they formulated a list of certain

¹The results have been published in three volumes: *Studies in Deceit*, *Studies in Service and Self-Control*, and *Studies in the Organization of Character*. 1928, 1929, and 1930, respectively.

mental contents and skills involved in ethical behavior. These included an adequate social-ethical vocabulary, generalizations concerning right and wrong, knowledge of natural laws, knowledge of moral principles held by different groups, knowledge of rights and sanctions, knowledge concerning the value of the jail and the hospital, and knowledge of the causes and consequences of social behavior.

A battery of five Information Tests was chosen to explore the moral knowledge and opinion of children.¹ Samples of these tests are given below.

1. *The Cause-Effect Test.*

Some of the statements made below are true and some are false . . .

Success always comes from hard work.	True	False
God punishes bad people by making them sick.	True	False

The ability to trace consequences back to their causes is an important factor in allocating one's own and others' moral responsibility for what happens.

2. *The Recognitions Test.*

After each statement are five letters: C, L, S, X, J. If the deed is a case of cheating, draw a circle around the C; if it is lying, around the L; if it is stealing, around the S. If it is something wrong, but not either cheating, lying, or stealing, put a circle around the X. If it is not wrong at all, put a circle around the J. If the thing is both cheating and lying or stealing and lying or all three, encircle all the letters you need to in order to express your opinion.

Using street car transfers that are out of date.

C. L. S. X. J.

Apologizing for a misdeed when you are not really sorry.

C. L. S. X. J.

¹H. Hartshorne, M. A. May, and F. K. Shuttleworth: *Studies in the Organization of Character*, Chap. 2. 1930. By permission of The Macmillan Company, publishers. These tests are published by the Association Press, 347 Madison Ave., New York City.

When you don't want to go somewhere, making up an excuse so as not to hurt anyone's feelings.

C. L. S. X. J.

A child cannot be subject to intelligent social control unless he can name his own acts. Thus, to make satisfactory social adjustments he must discover that keeping a package mailed to him by mistake is "stealing," and not "a piece of good fortune."

3. *Social Ethical Vocabulary.* In this test the subject is instructed to enter the number of the word, in the space to the right, that means the same as the first word.

MALICE. (1) spite, (2) poison, (3) glass, (4) character,
(5) hammer

REPROACH. (1) come near, (2) insect, (3) scold, (4) steal
game, (5) nerve

Words are necessary in order to communicate with others about ethical relations.

4. *The Free Response Foresight Test.*¹

Ruth's folks had a crowded apartment so they kept a lot of boxes and things on the fire escape.

(Space is given for a large number of possible consequences.)

Foresight of social consequences is one of the chief characteristics of the good man.

5. *Probability.*

John started across the street without looking both ways.

This is likely
to happen

This might
happen, but
not likely

This would
not happen

☐
☐
☐

1. He got hit
with an
automobile.

☐
☐
☐

2. He caused an
accident to
other people.

¹Refer to the section on *Anticipating*, pp. 466-476.

These tests were supplemented by another series called Opinion Ballot A., which included:

1. *The Duties Test*, in which the subject answers Yes, S (*Yes, sometimes, and sometimes No*), or No, as to whether it is his duty:

1. To help a slow or dull child with his lessons. Yes S No
4. To sneeze when you feel like it. Yes S No

2. *The Comprehensions Test*. What do you think would be the right thing to do or say?

1. If someone asks to borrow your pencil,
 - (a) tell him it's broken.
 - (b) tell him that you just lost it.
 - (c) tell him that you don't want to loan it.
 - (d) let him take it.

3. *The Provocations Test*. Here are some little stories of what some children did. You are to decide whether they did right or wrong. If what they did was not quite right, perhaps it was at least excusable in view of the circumstances. . .

Sample: Jane's family were too poor to buy fruit for her sick brother. So every now and then Jane took an apple or an orange from a fruit stand and brought it home to him.

NOW if you think she was absolutely wrong in taking the fruit, put a circle around the *Wr* . . . But if she did exactly right, encircle the *R* . . . If you think she was wrong but excusable . . . encircle the *Ex*.
R Ex Wr

1. Helen noticed that nearly everyone in the class was cheating on a test; so she cheated too. R Ex Wr

4. *The Importance Test*, in which the subject selects the most important of the consequences following an act.

This survey of the C E I (Character Education Inquiry) Tests affords valuable insight into the factors involved in the acquisition of ethical standards, as well as giving us a

glimpse of how moral concepts may be explored experimentally.¹

Among other results, the investigation disclosed that "children resemble their parents in their ability to score on the moral knowledge tests far more than they resemble their friends, club leaders, day-school teachers, or Sunday-school teachers, the influence of these adults appearing in this order."² The Inquiry also showed that a child's ethical codes are poorly organized, in that they vary so drastically from situation to situation. Perhaps we can relate these two findings, that is, the primary influence of parents and the moral confusion of children, by examining the sorts of values commonly instilled by parents in the receptive minds of their offspring.

Children are taught the virtues of honesty and kindness, though parents themselves know from experience that one of these virtues must be sacrificed at times in deference to the other. One cannot be kind if one insists conscientiously upon telling the truth on all occasions. Unfortunately, in our society good manners sometimes involve deceit. If a child is "bored stiff" at a party, he must still thank the hostess for a "lovely time" when he takes his leave.

It is common practice to urge a child, "Always tell the truth." But "if it is a fact that social life is such that a certain amount of judicious deceit is necessary on many occasions, should we not make this known to our children? Are we really being honest with our children if we keep up

¹For other tests on character, see:

S. C. Kohs: *Ethical Discrimination Test*. C. H. Stoelting & Company.

F. J. Shields: *Moral Judgment Examination*. Published by the author, 1594 Whitefield Road, Pasadena, California.

G. Watson: *Character Growth Tests*. The Association Press.

M. H. Wilson: *An Ethical Discrimination Test*. C. H. Stoelting & Company.

²H. Hartshorne, M. A. May, and F. K. Shuttlesworth: *Studies in the Organization of Character*, p. 93. 1930. By permission of The Macmillan Company, publishers.

a pretense to which they will eventually 'get wise' anyway? We know perfectly well that there are times when under certain circumstances it is best to remain silent, or to be evasive, or convey a false impression by telling part but not all of the facts with the conscious intent to deceive. Why should we contend then that one should always be one hundred per cent frank, candid, and undeceitful?"¹

The answer to that question is that it is much simpler to lay down flat rules about lying, cheating, or stealing than it is to train the child in analyzing situations to see why these forms of conduct may or may not be justified. Character education frequently consists of adopting a code and trying to get children to live up to it. But a code is, at best, only a statement of an ideal. It provides no basis for discriminating between one situation and another. For example, a code states, "Be obedient." Is the child, therefore, to obey everyone who gives him a command, or only certain persons? If so, whom should he obey? Under what conditions may he disobey? Surely the code is not meant to impart the rule that he must obey everyone, even his parents, if they order him to do something he knows is wrong. "A code is not worth much until it is analyzed in terms of the several situations in which it might be used. When this is done numerous exceptions will begin to appear. . . . The problem is to know where to draw the line . . . character education consists in teaching children where to draw the line."² Principles must be interpreted in terms of situations if a person is to maintain working relations with his fellows. A deceptive play in football, for example, is not unethical.³ It is an inherent part of the

¹M. A. May: "What Is Character Education?" *Parents' Magazine*, April, 1937.

²*Ibid.*

³Charles W. Eliot once remarked that "to pitch a curved ball seemed . . . to be a resort to a low form of cunning."

game. So, too, "white lies" may be a part of the "social game" which we all have to play according to the rules established by long usage. It is only fair, therefore, that parents in teaching honesty be honest themselves in preparing children to adopt principles of conduct that will function adequately in the real social world they will come to know through expanding horizons of experience. Otherwise, the imposition of absolute codes of morality is going to set up for the child impossible ideals and later the necessity for compromise will engender a morbid sense of guilt, attended with cynicism and disillusionment.¹

III. THE INDIVIDUAL AS A MEMBER OF SOCIETY

Everyone covets a pleasing personality. Personal charm is an asset because it enables an individual to live happily and effectively with his fellow beings. Many people seem to believe that a winning personality is a native endowment; that it is something you either have or have not; that there is nothing that can be done about it.

Link Link has discovered in his personnel work that something can be done about it; that an effective personality is dependent, to a large extent, upon the acquisition of certain habits and skills that make it possible for the individual to influence other people successfully. Learning to play tennis, for example, gives a person one set of personality habits by means of which he can interest others. Children who play in groups, who use up their energy during the day and who sleep during regular hours at night, have a higher Personality Quotient (P.Q.).² So do children who go to Sunday school, whose parents go to church. Membership in the Scouts, the Y.W.C.A.,

¹See Jean Piaget: *The Moral Judgment of the Child*. 1932.

²The I.Q., Link says, is a measure of the kind of intelligence required in school—a test in terms of what a person *knows* about things and people. The P.Q. is a new measure of what a person *does* about things and people. It is a yardstick of the traits required to get along in the world.

or the school orchestra is helpful. "The habits of remembering and repeating good stories, of introducing people to each other, of going around with a group of friends rather than a single one, of paying compliments to people, of refraining from so-called frank criticism of other people, of trying to meet people, of serving on committees, all contribute to a high P.Q."¹

According to Link, children who have learned to dance, who go to mixed parties, who walk to school occasionally with members of the opposite sex, excel in P.Q. those who do not. Children who worked for their money ranked higher than the "gimme" children. Individuals who "put themselves out" to make friendly overtures to people they disliked were superior. Youngsters who did their chores even when their fun was interfered with were high on the P.Q., because the ability to subordinate impulse to higher values is particularly important as an indicator that the child is becoming socialized.²

The ability to remember names is a valuable social asset. To remember a man's name is to pay him a subtle and effective compliment, for "a man's name," as Dale Carnegie says, "is to him the sweetest and most important sound in the English language."³ Try the following test on yourself. Allow two minutes to study the photographs and associate the correct name with each person. Then cover up the names, look at the photographs and record the full name of each one, numbering them in the same order.⁴ Allow two minutes for recording the names.

¹H. C. Link: "Personality Can Be Acquired," *The Reader's Digest*, December, 1936.

See also H. C. Link: "A Test of Four Personality Traits of Adolescents," *Journal of Applied Psychology*, 1936, 20, 527-534.

²See H. C. Link: *The Return to Religion*, Chap. 6, "Children Are Made." 1936.

³Dale Carnegie: *How to Win Friends and Influence People*, p. 113. 1936.

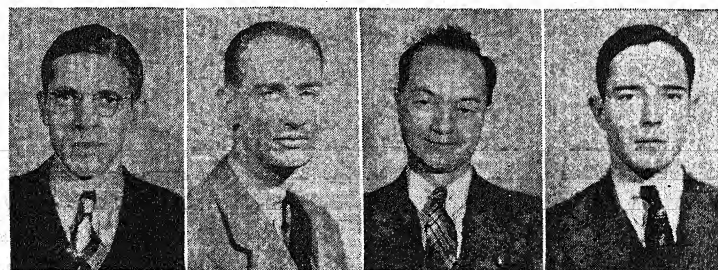
⁴This sort of task appears as one test in F. A. Moss, T. Hunt, and K. T. Omwake: *Social Intelligence Tests (Revised Form)*. Published by Center for Psychological Service, Washington, D. C. 1927.



1. Jim Lee 2. Herbert Clark 3. George Forman 4. Robert Tracy



5. Alec Smith 6. Frank Fraser 7. Sid Binder 8. Edward Marks



9. Leslie Moore 10. Joe Valentine 11. Don Wood 12. William Walsh

TEST FOR ASSOCIATING NAMES AND FACES

FREQUENCY TABLE OF SCORES

(For 50 college students on the test for remembering names and faces)

Number correct	Frequency	Number correct	Frequency
1	0	7	10
2	2	8	6
3	5	9	4
4	5	10	4
5	4	11	1
6	5	12	4

Arithmetic mean (average) = 6.84 correct.

If your personality is not what it should be, ask yourself the question that Alfred Adler often put to his pupils, "And what did you do about it to make it better?" A more winsome personality may be achieved by well directed efforts.

As a member of society it is incumbent upon the individual to learn the rules governing social conduct. These rules are concerned with conventions and customs. Conventions are the forms regulating manners, such as tipping one's hat to a lady; customs involve the usages regarding the more essential aspects of living, such as dwelling in heated houses and providing care for the sick and aged.¹

Respect for the conventions is motivated largely by the fear of social disapproval, especially as it is manifested in gossip. The individual must do only those things that are considered seemly and decorous by "nice people." Otherwise, he is likely to be branded as a social heretic and ostracized for his non-conformity.

"There is a time and a place for everything." Sumner named this principle conventionalization.² An act may be

¹See E. A. Ross: *Social Psychology*. 1918.

²W. G. Sumner: *Folkways*, pp. 68ff. 1911.

sanctioned in one situation but not in another. The individual must learn to govern his conduct accordingly. A bathing suit is considered proper attire on the beach but it is not regarded as the correct ensemble for a person mowing his front lawn. "Shorts" may be approved on the tennis court but not on the golf links; they may be tolerated on women in the public square but not on men in the same circumstances, depending of course on the year and the locality, for certainly "shorts" on anybody would have been highly shocking back in 1900. The person who wants to be recognized as cultured must acquaint himself with the rules of etiquette that govern the behavior of *ladies* and *gentlemen*. How well informed are you in this respect? Try this test:

SOCIABILITY TEST¹

Knowledge of the Upper Social Strata

Directions.—The following statements are either true or false. Put a circle around the T, if True, or the F, if False.

- T F 1. A gentleman should sit to the left of the lady at dinner.
- T F 2. When sitting down at the dining table with a young lady, the gentleman should wait for the waiter to push her chair up to the table.
- T F 3. Brick ice cream should always be eaten with a spoon.
- T F 4. When the waitress sets down your dishes, you should thank her.
- T F 5. At the dining table, you should keep quiet and attend to your eating.
- T F 6. At a formal wedding, the bride should march up to the altar on the arm of the bridegroom.
- T F 7. It is well to tip the maids at a hotel after a visit of two days.

¹H. W. Hepner: *Psychology in Modern Business*, pp. 714-716, 718. 1930. (Reprinted by special permission of the author and Prentice-Hall, Inc., publishers.)

- T F 8. Salads are always at the left of the plate.
- T F 9. The man should not offer to shake hands when introduced to a lady.
- T F 10. In a social group, always monopolize the conversation because it puts the others at ease.
- T F 11. The man should always precede the girl when approaching seats in a theater, when no usher is present.
- T F 12. If something disagreeable is found in the food at a dinner, the host's attention should be called to it.
- T F 13. The bridegroom should wear a Tuxedo.
- T F 14. Spats should not be worn with evening clothes.
- T F 15. Sport clothes can be worn to informal evening parties.
- T F 16. It is considered proper to wear a watch and chain across a Tuxedo vest.
- T F 17. R. S. V. P. means that your presence is requested.
- T F 18. Olives may be taken with the fingers.
- T F 19. After finishing eating, the fork should be laid on the plate with the prongs upward.
- T F 20. When served with soup, crackers may be broken into the cup.
- T F 21. The gentleman sitting next to a strange lady in a theater should assist her when she wishes to take off her coat.
- T F 22. In introducing a friend to another friend, the younger person is presented to the older person.
- T F 23. Lettuce should not be cut with a knife.
- T F 24. When the proprietor of a restaurant waits on you, it is proper to tip him.
- T F 25. It is necessary to wait for the hostess to start eating.
- T F 26. It is correct to pay a condolence call.
- T F 27. Demi-tasse is a vegetable.
- T F 28. Pie à-la-mode is very good without ice cream.
- T F 29. The typewriter can be used to answer social letters.
- T F 30. In serving a meal, all drinks should be served on the right.
- T F 31. It is proper to shake hands across a dinner table upon an introduction.
- T F 32. In buttering bread, the bread should be broken and held in the hand while being buttered.
- T F 33. In correspondence, the term "My dear" is more formal than "Dear."

- T F 34. When calling for a girl friend, it is permissible to sit in the car and blow the horn until she signals that she is coming.
- T F 35. Acceptance to a formal party should be telephoned.
- T F 36. Frankness is not necessarily a virtue.
- T F 37. It is proper for a lady to take the arm of a man when walking on the street during the day.
- T F 38. It is never permissible to cut an egg with your knife.
- T F 39. A wedding at high noon is always formal.
- T F 40. A distinguished guest should be seated at the right of the hostess.
- T F 41. It is necessary to excuse yourself from a group upon leaving the room temporarily.
- T F 42. A gentleman should never disagree with a lady even though she may be wrong.
- T F 43. It is correct form to "excuse your glove" and shake hands without removing it.
- T F 44. In sending out invitations to a wedding, the added inquiry of "R. S. V. P." is permissible.
- T F 45. It is proper for a girl to applaud at a dance.
- T F 46. A Protestant on entering a Catholic church should try to follow the services.
- T F 47. Bluepoint cocktail should be eaten with a spoon.
- T F 48. The mouth should always be wiped before drinking water.
- T F 49. Bowls in a wash room of a Pullman should be wiped out after use.
- T F 50. Food should always be passed first to the ladies on each side of you when at a meal.
- T F 51. At a formal dinner dance, each couple should wait for the hostess to dance before they dance.
- T F 52. The shirt cuffs of a man should show when he is wearing a coat.
- T F 53. One should congratulate a lady on her engagement.
- T F 54. The card of a married woman is smaller than that of a man.
- T F 55. When two women are introduced, they should shake hands.
- T F 56. The customary hour for calls is 3:30 to 4:30.
- T F 57. At an informal dinner the men must give the women their arms.

T F 58. The lady should precede a man when entering a restaurant.

T F 59. A man may wear a strap-watch with a Tuxedo.

T F 60. A lady may wear a sorority pin on a formal dress.¹

The individual must be aware of the imperious nature of conventions. The penalties attached to their violation are so serious that it is dangerous to flout them, no matter how absurd they may appear to the person himself. The man who exposes his suspenders, or wears a straw hat after September fifteenth must be willing to face the scorn of his fellow citizens, if he is going to insist on being different. Pressure will be brought to bear upon him to "mend his ways." If he refuses, he must be ready to endure the penalties imposed upon those who "just won't conform."

Customs are more enduring than conventions, representing, as they are supposed to do, "the wisdom of the ages." Customary behavior is sanctioned by long usage. Thus we may state that war has become an established custom as a means of settling international disputes; the capitalistic system, a customary way of exchanging goods; family life, with the man as the head of the household, the recognized arrangement of rearing the young; burial of the dead, the accepted practice for disposing of the deceased.

Custom represents the earliest known stage of law; it is not enacted or even declared—it is established as the result of experience. Thus primitive man, we may conjecture, planted his crops at certain seasons of the year. Sometimes he reaped no harvest, because, he believed, the offended gods had destroyed everything. From this state of fear, custom was his first great deliverer. What had been done once in safety might possibly be done again. What had been done many times was fairly sure to be safe. A new departure was beset with dangers. Hence the

¹Key to this test will be found at the end of the chapter.

terror of primitive man for the innovator, hence his reverence for custom. Modern man, of course, is still more or less of a slave to custom. Hence the tendency to be conservative, "to play safe," to stick to the tried and true.

The wisdom of customs may not always be apparent. Such is the case with certain dietary taboos practiced by religious groups, like the taboo against pork among the Jews. Pork, we know now, may convey the disease of trichinosis unless it is properly cooked. The early Jews were wise to avoid it, apart from any religious motives that prompted the taboo. A similar wisdom induced the practice of setting aside one day of the week as a day of rest. Thus the keeping of the Sabbath provided a time for relaxation and an opportunity to enjoy the values to be derived from worship.

Customs serve a useful function in consolidating the group. Standardized modes of behavior create a feeling of solidarity conducive to group morale. Because of this fact, they come to be regarded as sacred, that is, above critical examination, and the group sees to it that innovators who question practices of long standing are properly punished for their presumption. Certainly anyone who is tempted to break away from the old ways of doing things should recognize what his conduct may mean in terms of family disruption and social isolation.

The intelligent person, of course, realizes that the folkways or mores may become so adamant with age as to prevent adaptation to changing circumstances, thus producing stagnation and maladjustment. The feeling that "What hath been, forever more shall be, world without end," may prompt a person to believe that nothing should ever be done for the first time. Since legal procedure is based on precedent, there is a tendency among lawyers to follow the beaten paths. As one lawyer put it: "The law

of precedent means something secure, something steadfast, something comparatively changeless in a constantly changing world." Such a reverence for the past may engender a stupid inertia.

When customary attitudes remain fixed while progress takes place in the material world, a cultural lag results. Thus technological changes contribute to the creation of unemployment; yet we continue to regard the unemployed, in many instances, as shiftless and "defective in character." Similarly, reverence for the Founding Fathers may involve us in social maladjustments, since we are faced today with economic problems they never could have anticipated.¹ The intelligent citizen realizes that loyalty to our fathers does not consist in standing where their journey ended, but in pursuing the path their vision discerned.

So the wise person practices rational discrimination in dealing with customs. He is an heir of the past, not a slave to it. He holds fast to that which is good—and only that which is good.

Prejudice is another important factor in social relationships. Judgments upon social issues, formed without due respect for evidence, are responsible, in a large measure, for much of the bitterness involved in our social conflicts.

As a means of analyzing your own attitudes, answer the following questions—as honestly as you can. Do you believe that:

1. Anarchists should be deported?
2. Anarchists should be denied citizenship in this country?
3. Anarchists should not be allowed to teach in the public schools?
4. Anarchists all carry bombs under their coat tails?
5. It would be unwise, if you were an employer, to hire an anarchist?

¹See T. W. Arnold: *The Folklore of Capitalism*. 1937.

Now that you have answered the above questions, define the word *anarchy*, and point out what it means in its social implications. When you have finished your exposition, look up the word *anarchy* in a dictionary and an encyclopedia to check the accuracy of your concept. Are your attitudes toward *anarchy* and *anarchists* based on knowledge or ignorance? If they are based on the latter, they are definitely prejudices.

How do you feel about

A high tariff?
Cancellation of the war debts?
Christian missions?
The gold standard?

Do you really know enough about any of these problems to arrive at an intelligent, unprejudiced opinion? Most of us feel strongly one way or the other about these matters. We leap to conclusions instead of suspending judgment while we search for more evidence upon which to base our opinions.

Goodwin Watson has devised a Test of Public Opinion for measuring fairmindedness.¹ One test calls for the crossing out of disagreeable words, such as

Bolshevist
Sunday Blue Laws
Prohibition
Wall Street

Another test involves grading the degree of truth involved in such statements as

Dancing is harmful to the morals of young people.

Preaching is one of the most effective ways of leading people to live better lives.

Poor men cannot get justice in the courts today.

¹See G. Watson: *The Measurement of Fairmindedness*. Contributions to Education, No. 176, Teachers College, Columbia University. 1925. By permission of the Bureau of Publications, Columbia University.

The Inference Test is based on the idea that facts mean different things to different people, depending on their respective interpretations.

Statistics show that, in the United States, of 100 men starting out at an age of 25, at the end of 40 years 1 will be wealthy and 54 will be dependent upon relatives or charity for support.

1. ☐ The present social order cheats the many for the benefit of the few.
2. ☐ The average young man, under present conditions, cannot count on being wealthy at the age of 65.
3. ☐ Most men are shiftless, lazy, or extravagant; otherwise they would not need to be dependent.
4. ☐ The one man is living upon luxuries ground out of the bones of the mass of common people.
5. ☐ Some day the workers will rise in revolt.
6. ☐ None of these conclusions can fairly be drawn.

The Moral Judgment Test asks for judgments of right or wrong on such an issue as pacifism. Are pacifists bravely standing up for their ideals or are they misguided? Other tests involve the evaluation of arguments, and generalizations. The test as a whole constitutes A Survey of Public Opinion on Some Religious and Economic Issues.

Prejudices exert a subtle influence upon our conduct, since the individual is often unaware of his own predispositions. This fact was shown by a student who answered an examination question (1932) —“Where did you get your political opinions? Taking yourself as a sample, what do you think of the hope for democracy?” Answer:

I have no pronounced political opinions inasmuch as I am not yet able to vote. I think as my father, mother, sister, and all my in-laws think because we have always been Republicans, therefore I naturally would be.

I'm afraid this reasoning is not in the least intelligent. I am also against the repeal of the 18th amendment. I'm not old enough to remember seeing men lurch from the corner saloon, but I have heard about it in our family discussions. In college

one sees drinking a lot—at least where I go. But I know quite a few girls who don't drink now who would drink if it were no longer prohibited. It is only their social consciousness which makes them afraid. Our home is absolutely dry and having been brought up in such an environment I shouldn't openly become wet.

Democracy's prospects don't appear very bright to me. The Democratic party has done a lot of talking and really have said little. Roosevelt has no definite plank except repeal. Hoover has at least stated what he intends to do if he is re-elected. He may not get all the things done, but his intentions are good.

This is none of it intelligent, but I can't talk on what I know little about. Too many people do that as it is.

In the political campaign of 1928, some people were opposed to "Al" Smith because he was a Catholic. They were unwilling to admit, however, that religion influenced them in their attitudes. They were forced, therefore, to rationalize. Thus some Protestants were not opposed to Smith because he happened to be a Catholic, but because he wasn't "cultured," or because he lacked "dignity" and "respectability."¹

Prejudices are based fundamentally on individual differences, which make for misunderstanding and hinder sympathy. Thus we may not like people whose skin is of a different color or people who pick their teeth in public or people belonging to a different race. There is a great deal of prejudice in America (and in Germany) against the Jews. The animosity is due primarily to the fact that the Jews are different; and it is true that they are different, both in "race" and religion. Economic grievances are then invented to justify the prejudice against the Jews, such as the feeling that "the Jews monopolize American business and industry." An investigation by *Fortune* disproves this contention, but many Americans will con-

¹W. F. Vaughan: "An Experimental Study in Political Prejudice," *Journal of Abnormal and Social Psychology*, 1930, 25, 268-274.

tinue in their convictions, regardless of the facts, because they must have some justification for their attitudes.¹

Racial prejudices may be investigated by a test called Opinions on Race Relations.² A typical statement is:

All Most Many Few No—Jews will try to get the best of a bargain, even if they have to cheat to do so.

The intelligent individual will be interested in examining his own prejudices so that he may base his conduct upon facts rather than fictions.

Good citizenship has become a popular ideal of our modern educational program.³ What does it mean to be a good citizen? The answer to that question would vary considerably from person to person. In the light of our discussion regarding the individual's concern with personality development, with conventions, customs, and prejudices, we may state, humbly, that the good citizen is one who is aware of his social obligations and who uses his best insight in the fulfillment of those responsibilities. The definition of good citizenship in the totalitarian state, where the government makes up the citizens' minds for them would, of course, differ from the above conception. But in a democracy such as ours the individuals are supposed to do some thinking for themselves. How much thinking is encouraged or tolerated when it is radically non-conformist in nature, is a problem beyond the scope of our treatment.

In 1937 the Institute for Propaganda Analysis was established in New York, to "help the intelligent citizen detect and analyze propaganda."⁴ The techniques of

¹"Jews in America," *Fortune*, February, 1936.

²*Series of Character and Personality Tests*. Published by the Association Press, New York.

³For a test of *Good Citizenship*, see the one by that title published by the Association Press.

⁴For information concerning this program, write the Institute for Propaganda Analysis, 130 Morningside Drive, New York, N. Y.

propaganda have been so extensively applied by the press, the radio, the theater, the school, and the public relations counsel, that it is felt a need exists for aiding the bombarded citizen in sifting truth from falsehood. The Institute's *Monthly Letter* of November, 1937, is on "How to Detect Propaganda." We are fooled by propaganda, chiefly because we do not recognize it. The person who familiarizes himself with the seven common propaganda devices¹ may be in a position to detect how he is being affected by such influences.

1. *Name calling.* By using bad names in appealing to hate and fear the propagandist discredits individuals, groups, nations, races, policies, and beliefs: Fascist, demagogue, economic royalist, Tory, Constitution-wrecker.
2. *Glittering generalities.* By appealing to love and brotherhood, the propagandist identifies his program with virtue, through the use of "virtue words": liberty, justice, democracy, the American Way. Thus to some the New Deal is "a prophecy of social salvation" while to others it is "an omen of social disaster."
3. *Transfer.* By this device the propagandist carries over the authority, sanction, and prestige of something we respect and revere to something he would have us accept. For example, a cartoonist by having Uncle Sam disapprove a budget for unemployment relief would have us feel that the whole United States disapproves of relief costs.
4. *Testimonial.* Prominent people give their endorsements to patent medicines, cigarettes, and breakfast foods.
5. *Plain folks.* Politicians, labor leaders, businessmen, ministers and educators win our confidence by appearing to be people like ourselves—"just plain folks among the neighbors." They go to country picnics; they pitch hay and go fishing; they believe in home and mother.

¹Used by permission of the Institute for Propaganda Analysis.

6. *Card stacking.* The propagandist stacks the cards against the truth. He uses underemphasis and overemphasis to dodge issues and evade facts; omits facts; resorts to lies; creates a smoke-screen of clamor by raising a new issue when he wants an embarrassing matter forgotten.
7. *The band wagon.* This is an appeal to follow the crowd—"Everybody's doing it." Campaigning for or against a program the propagandist tries to enlist our support as Catholics, Protestants, or Jews. "Don't throw your vote away. Vote for our candidate. He's sure to win."

An insight into the devices of propaganda may help the individual to maintain his independence of judgment despite all the pressure groups that try to sway his attitudes in favor of their respective causes. The program of the Institute for Propaganda Analysis has been described as a concrete example of the kind of education that is likely to produce good citizenship.

We have defined good citizenship in terms of social obligations. Unfortunately, we are apt to restrict our concept of citizenship to the discharge of responsibilities within the limits of a single governmental jurisdiction. Looking at the problem with a larger perspective, we come to appreciate that good citizenship must be extended to include intelligent attitudes and practices toward people of other nations.¹ A spirit of international understanding is a requisite of good citizenship in our time. Socialization must be carried beyond national boundaries if we are going to prepare ourselves for social adjustment on a scale commensurate with our present international interdependence.²

¹For tests on this subject, see: G. B. Neumann, D. H. Kulp II, and Helen Davidson: *Test of International Attitudes*. Teachers College, Columbia University.

See also *Opinions on International Questions*. Published by the Association Press, New York.

²H. A. Overstreet: *A Declaration of Inter-dependence*. 1937.

IV. SOME PERSONAL PROBLEMS

There are three situations in life that involve a host of personal problems: education, occupation, and marriage. Psychology can be a great help in meeting these problems intelligently.

A. Education. Modern educators aim to individualize their programs so that each pupil gets the particular training which he as a unique individual needs. This principle is well exemplified in the efforts that are being made to educate exceptional children, that is, those who are handicapped by mental retardation or by physical defects. Almost every child, it is felt, is capable of doing something for the general welfare. In the business world the less competent are weeded out and removed because the employer must do everything, in our competitive culture, to promote efficiency. Whereas the employer tests persons by their ability to succeed in his social system, the modern educator is more inclined to test the social system by its contribution to every human personality. Educators would start, therefore, with human personalities as they find them and set themselves the task of building the kind of school program which is best fitted to human specifications. The blind, deaf, crippled, mute, ill, and mentally retarded are not liabilities just because there are tasks beyond their powers. We must get away from the feeling that those who do not come out on top are failures. Society should be flexible enough to be attuned to man's frailties. Every deviate, however talented or handicapped or both, constitutes to the school and to society this challenge: "How can we make better use of his potentialities?"¹

The problem of grouping children in school in such a way

¹Goodwin Watson: "The Exceptional Child as a Neglected Resource," *Child Research Clinic Series*, Vol. II, No. 6, the Woods Schools, Langhorne, Pa.

that each child will benefit maximally from the classroom training has been a difficult one. Where children are grouped merely according to age, without reference to relative intelligence, a situation is created in which the bright ones may have to slow up to keep pace with the dull ones while the latter get discouraged by the one-sided competition. To avoid such difficulties homogeneous grouping has been introduced. In this system the sectioning is done on the basis of mental age, those of the same mental age being grouped together.¹ Certain objections have been raised against homogeneous grouping, largely on the ground that such grouping does not duplicate life situations where individuals must get along with people of varying levels of intelligence. If education is to concern itself with the total personality of the child, grouping with respect to intelligence alone, it is felt, must be regarded as an unwise procedure.

Who should go to college? This question may be answered partially by ascertaining what reasons those who do go to college give for their continuing their education. The reasons given in one survey are: preparation for a vocation, improvement in culture, the market value of a degree, interest in studies, prestige of a college education, the wishes of parents, social or athletic attraction, example of friends, or the development of intellectual superiority. A self-rating scale of the qualities required for success in college has been devised by Lonzo Jones. This *Shall I Go to College Self-Rating Scale* includes the following considerations:

Do I love learning?

A love of learning is characterized by:

An insatiable desire to know things;

¹See H. Woodrow: "Practice and Transference in Normal and Feeble-Minded Children," *Journal of Educational Psychology*, 1917, 8, 85-96.

a lively curiosity about facts and events;
a hunger to read history and literature . . .

.

Grades in high school

The percentage of school time spent on studies as compared
with time spent in other ways . . .

Do I have ability?

Do you have a good memory?

If you learn easily and quickly; if you organize your ideas
logically and recall them accurately and promptly when
needed, you have a good memory . . .

.

How well can I read?

Primarily, reading skill means one thing—*the ability to get
Meaning from the printed page* . . .

Is my family backing me?

.

Can I lay out a plan and stick to it?

.

Can I pay the price?

.

Shall I go to college?

. . . The object of this letter has not been to urge you to
go to college, nor to discourage you from going; but to aid
you in making a wise decision . . .¹

All of these questions should be seriously considered by a
person contemplating a college education.

Psychological tests will probably play an increasingly
important role in selecting students who are mentally
equipped to benefit from a higher education. It is better
for all concerned to eliminate the incompetent at the

¹Published by the Public School Publishing Company, Bloomington, Illinois.
1930.

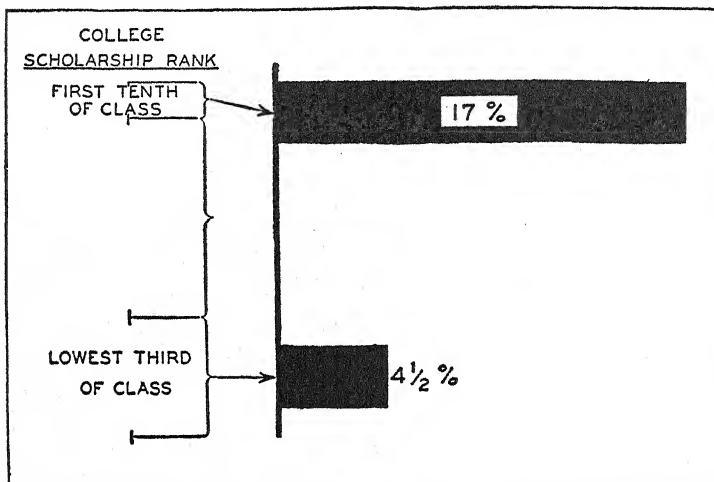
See M. N. Thisted and L. Jones: "A Critical Analysis of the Personnel In-
formation Blank in Use at the State University of Iowa," *School and Society*,
April 18, 1931.

start. College-entrance examinations have been the main basis for selection in the past. Some colleges today are putting more stress on all-around personality, while some are admitting students who can demonstrate their scholastic aptitude on such a test as the Psychological Examination sponsored by the American Council on Education. In the latter case it is possible for intelligent students who, for various reasons, have not obtained the regulation entrance credits, to enter college and to prove their fitness as indicated by the Psychological Examination. One great advantage might accrue to a system that breaks away from the traditional entrance requirements—high schools and preparatory schools would be able to train their students more in accordance with their individual needs and interests, instead of pointing incessantly for particular entrance examinations. Thus the secondary schools could abandon the emphasis on *preparation*, relinquish their tutoring function, and concentrate on an educational program that would have more meaning for students at that level.

College students often find it difficult to budget their time with respect to the relative merits of curricular and extracurricular activities. Some individuals easily convince themselves that "you get more out of heeling for the *News* or singing on the Glee Club than you do out of boning on your studies." There is evidence to refute this contention, gathered through investigations of the relationships between college grades and subsequent business or professional success.¹ The American Telephone and Telegraph Company found in the Bell System that the longer the best students (as judged by their classroom records) are in business, the more rapidly their earnings

¹For a summary of the studies made concerning this problem, see H. L. Hollingworth: *Vocational Psychology*, Chap. 8, "The School Curriculum as a Vocational Test." 1919.

rise; the longer the poorer students are in business, the slower their earnings rise.



PERCENTAGE OF SCHOLARSHIP GROUPS NOW IN HIGHEST TENTH SALARY GROUP

Men from the first tenth of their college classes have four times the chance of those from the lowest third to stand in the highest tenth salary group. (Walter S. Gifford: "Does Business Want Scholars?" *Harper's Magazine*, May, 1928.)

The conclusion is sometimes drawn from this study and from similar investigations,¹ that it "pays to study hard and to get good marks." A Phi Beta Kappa key, therefore, is worth getting. The situation, however, is too complicated to permit of such a simple conclusion. Students who do well in their studies probably excel because they are superior in intelligence and not because they work hard. That superior intelligence also makes them stand out in the business world later. This observation does not imply, though, that there is "no point in studying hard." The main business of a college education is the cultivation of intellectual interests. Those students who

¹See John R. Tunis: *Was College Worth While?* 1936.

want to make the most of their college days will concentrate their efforts on their studies, will generalize far enough to see that habits of industry may carry over to their later careers, and will discover, we hope, that cash dividends will not ever constitute the only measure of the values derived from university training.

One purpose of a college education is to awaken intellectual curiosity in the individual so that he will want to investigate his own beliefs and then do what he can to bring them more definitely into relationship with the world revealed by modern science. Conklin found that many college students, at one time or another in their lives, believed in the following superstitions, among others:

Knocking on wood
Four-leaf clover
Sleep on wedding cake
Black cats
Friday the thirteenth
Walking under a ladder
Breaking wishbone
Moon over shoulder
Breaking mirror
Spilling salt cause of quarrel
Horseshoe
Knife cuts friendship

Superstitious belief was admitted by 53 per cent of the group studied, by 40 per cent of the males and 66 per cent of the females. The superstitions of the women are concerned chiefly with domestic and social affairs and the intimately personal; those of the men, with sports and business. Conklin concludes:

There is ample evidence, for this group at least, that the superstitiousness is not entirely due to contact with superstitious people. The persistence of superstition in spite of education and the development of reason, the prevalence of superstition, the variability of superstition forms, the slight coinci-

dences or trifling events which give rise to new superstitions, the readiness with which incidents are accepted as proof, and the evidence of strange feelings and emotions which impel in spite of reason—all point to a predisposition to such emotional reactions to the events of life as are conducive to belief in mystic interpretations.¹

Many schools provide psychological and psychiatric counsel for students. The mental hygiene program, as it is administered, is not a search for mental disease but a program for increasing personal efficiency. An educational clinic may be able to discover reading disabilities or other handicaps which can be remedied, thus giving a student the opportunity to gain more benefit from his studies. Guidance is needed by college students who may be facing emotional or financial problems which are too much for them to solve without the aid of counselors well versed in such matters.² An adequate guidance program should include:

Educational counseling

for improving study habits . . .

Vocational counseling

for helping the student to plan his courses and to choose a vocation . . .

Personality counseling

for analyzing personality and facilitating social adjustment . . .

Religious counseling

for keeping religious interests alive and for advising the student who is involved in adjusting his religious beliefs to his expanding intellectual horizon . . .

Financial counseling

for giving advice on the budgeting of expenses . . .

¹E. S. Conklin: "Superstitious Beliefs and Practice among College Students," *American Journal of Psychology*, 1919, 30, 83-102. Reprinted by courtesy of the *American Journal of Psychology*.

²See E. G. Williamson and J. G. Darley: *Student Personnel Work*. 1937.

Legal counseling

for helping the student who may become involved in legal difficulties . . .

The functions of education are manifold. Psychology has helped to find out what needs to be done and what techniques can be employed to make the school training most effective in terms of individual human nature.

B. Occupation. Getting a job in these days is quite a problem in itself. Getting the right job is even more difficult, particularly when young men are reminded by their relatives that they "can't be too choosy about it." The pressure of economic necessity may impel a person to take a position for which he is not fitted. The resulting failure may leave the individual emotionally depressed and may, also, interfere with the opportunity to shift to another kind of work for which he may be better qualified.

Square pegs in round holes not only mean an expensive labor turnover for the employer; such situations mean discontent, inefficiency, and unrest among the workers. An individual in the wrong occupation is apt to be easily fatigued. His capacity to earn good wages is reduced by his emotional maladjustment. The annoyance occasioned by the unpleasant task makes the worker a source of disturbance, since he is apt to communicate his dissatisfaction to his fellow workers, he is predisposed to strikes and walkouts, and he is likely to "take out" his disgruntled attitude on his wife and family at home. From every point of view it is important that employment be regulated by a system of scientific selection.

Securing a desired position is largely a matter of "selling yourself" to your prospective employer. The job-seeker should regard himself as a commodity.¹ On his own account he should be interested in an inventory of his

¹H. Stephenson and J. Keeley: *They Sold Themselves*. 1937. By permission of Hillman-Curl, Inc., publishers.

resources to determine what he has to offer that will make an employer want to purchase his services at once. Resourcefulness and initiative are often determining factors in the situation. Two examples will illustrate this point:

One hot summer day a man walked into the classified ad department of the *New York Times* and calmly asked the rates on half a page for a want ad. The ad man gasped, then named the sum. The customer did not flinch. He took half a page for \$1000. He handed in the copy for the ad to the incredulous ad-taker. The head ran:

"No position under \$50,000 a year considered."

It seemed like a complete waste of money to the ad man, but it wasn't. The applicant got eighty answers to his request—and one of them was for just the job he wanted.

Ralph Neave, Jr., graduated from college during the depression. He borrowed \$8.88 from his father and spent it to have 2,500 books of matches printed: "Have you a job for Ralph Neave, Jr?" He listed his qualifications and his address. Overnight, it was a hit. Newspapers picked up the story. He received twenty-five letters of commendation for his enterprise and three offers of temporary jobs.¹

These two cases are somewhat spectacular but they serve to illustrate the principle that the job-seeker must be self-confident; he must display qualities of initiative and originality if he wants to secure the favorable attention of an employer, especially if it is the better type of job he is seeking.

The interests of the employee and the employer are reciprocal. Both parties are better off if the right man is placed on the right job. There is some danger, however, that the employer, in concentrating his efforts upon making money, may forget the human values involved in industry. Symonds points out that some employers lack

¹H. Stephenson and J. Keeley, *op. cit.*

a feeling of responsibility toward the worker.¹ The applicant is hired; if he fails to make good on the particular job, he is fired, and permitted to shift for himself. If the employer were really interested in the welfare of the employee, he would investigate the situation to see whether, perhaps, the individual could be shifted to a different line of work in the same company. If such a shift proved to be impossible, the discharge, at least, would take the form of a reference, helping the worker to find satisfactory employment elsewhere.

Fortunately, the more enlightened employer of the present day relies upon scientific personnel guidance in selecting his employees in order to make sure that they are properly placed in the beginning. He depends upon vocational counselors, too, in determining promotions, instead of basing them upon length of service or wining and dining. Efficiency and happiness are both increased by the application of modern principles of vocational selection.²

A complete guidance program in industry includes both vocational counsel and psychiatric counsel. The vocational program involves job analysis and personal analysis. The psychiatric program is designed to prevent the development of unhealthy forms of adjustment and to re-educate those persons who need special therapeutic attention.

The first task of the vocational counselor is to analyze the tasks involved in the various jobs throughout an organization. He must discover what abilities are needed before he can be in a position to test for workers who have the necessary qualifications.

After the various jobs have been analyzed, the counselor

¹P. M. Symonds: *Psychological Diagnosis in Social Adjustment*, Chap. 4, "Diagnosis of Vocational Fitness." 1934.

²See W. V. D. Bingham and M. Freyd: *Procedures in Employment Psychology*. 1926.

prepares tests to use in his personal analysis, supplementing the specialized tests with rating scales and questionnaires like the ones described in Chapter 13, and with interviews conducted according to definitely planned procedures.

Thus Anderson made a survey of the sales clerks for Macy's Department Store, to determine the characteristics distinguishing the best and the worst sales clerks in the organization.¹ The clerks, of course, were classified in the two groups according to their records.

The best clerks were married, had no home problems, were of average or superior intelligence, had fewer physical disorders and defects, had no serious personality disorders.

The worst clerks were introverted and underactive, lacked aggressiveness and convincingness, were unresponsive, were given to daydreaming and reverie, lacked courtesy and pleasantness, were deficient in initiative.

Integration of personality was a good index to mental health and mental efficiency:

48 per cent of the best were regarded as well integrated;
only 6 per cent of the worst.

With respect to insight—the ability to meet issues openly and frankly, and to evaluate oneself properly:

48 per cent of the best were rated good; 6 per cent of the worst.

Interest in the job was a vital element in adequate performance and ultimate success:

94 per cent of the best showed good interest;
26 per cent of the worst.

In sales appearance:

82 per cent of the best excelled;
36 per cent of the worst.

The best clerks also had better attendance records, fewer disciplinary records, and a better knowledge of merchandise.

¹V. V. Anderson: *Psychiatry in Industry*, Chap. 8, "Qualities Distinguishing Good and Poor Sales Clerks." 1929. Reprinted by permission of the publishers, Harper and Brothers.

Such an inventory of the qualities that are desirable in sales clerks is an aid in designing tests for placing applicants intelligently.

Many employers rely upon interviews in passing judgment upon job-seekers. The confidence most interviewers have in their ability to select people wisely is not justified by the evidence.

Fifteen salesmen were to be selected for the American Tobacco Company, from twenty-nine applicants, each of whom were rated by eight interviewers. Each interviewer rated the applicants by ranking them from 1 to 29.

A comparison of the ratings by the eight interviewers shows that not one of the twenty-nine applicants would have been selected as one of the fifteen salesmen by all eight judges.

The four men who achieved the best sales records later, had been given average ratings of 7, 11.5, 15, and 9. Each one of these men would have been rejected by one or more of the judges.

The disagreement between the ratings of the different judges is in itself an indication of the inaccuracy of the judgments involved.¹

Investigation shows that judgments vary significantly from person to person. The judgment is determined by the personality of the judge himself.²

Two thousand homeless men were interviewed to discover the cause of their predicament. Interviewer A found that liquor was primarily responsible in 62 per cent of the cases; Interviewer B assigned it first place in only 22 per cent of the cases. Interviewer A found industrial causes accounted for only 7 per cent of the downfalls; Interviewer B reported that this was the primary factor in 39 per cent of the cases. Investigation of the

¹C. H. Griffitts: *Fundamentals of Vocational Psychology*, pp. 129-130. 1924.

²See J. G. Jenkins: *Psychology in Business and Industry*, Chap. 4, "Selection by Means of Personal Estimates." 1935.

judges revealed that A was an ardent prohibitionist and B was an active worker for social reform.¹

Since judgments are so highly colored by the predispositions of the judge, it is seldom safe to rely on the judgment of one interviewer in vocational measurement.²

The interview is a useful technique if it is intelligently administered by an expert well versed in its possibilities and its limitations.³ In any case, it should be supplemented by objective examinations, especially by rating scales and questionnaires. Certainly too much reliance has been placed upon the interview, in the past, as a basis for vocational selection.

The vocational aspect of the guidance program has been described. There is still the psychiatric counsel to be considered. The psychiatric point of view stresses all the factors in the case—physical, mental, and social. It implies a “total situation” psychology, as contrasted with the purely job-ability or job-aptitude psychology.

The function of the psychiatrist is to help the individual solve his industrial, personal, and domestic problems, so that he may be emotionally fit to carry out the tasks involved in his work. The psychiatrist is a consultant and as such he is concerned with the integration of all the diagnostic adjustment and therapeutic facilities available in the organization.

The psychiatrist is interested in the average normal employee and his adjustment to his job. Through his

¹S. A. Rice: “Contagious Bias in the Interview,” *American Journal of Sociology*, 1929, 35, 420-423.

²See A. T. Poffenberger: *Applied Psychology*, Chap. 15, “The Role of Judgment in Vocational Psychology.” 1928.

See also H. L. Hollingworth: *Judging Human Character*, Chap. 5, “The Personal Interview.” 1922. Also: *Vocational Psychology*, Chaps. 6-7, 1919.

³See G. W. Allport: *Personality: A Psychological Interpretation*, Chap. 18, “The Ability to Judge People.” 1937.

Two guides to interviewing may be found in *Diagnostic Interviewer's Guide* and *Aids to the Vocational Interview*; both published by the Psychological Corporation.

acquaintance with mental and physiological abnormalities, the psychiatrist has secured a much deeper comprehension of the mental processes which take place in every individual, even in those regarded as unmistakably normal. Faulty ways of meeting situations, unhealthy mental pre-occupations, inferiority feelings, anxiety states, fears and hatreds, irrational attitudes, pessimistic moods, prejudices, obsessing reveries, which in the average normal person go undetected, have, till recently, received no special care and consideration. To these conditions, in supposedly normal people, may be attributed a large proportion of work failures, domestic difficulties, and serious social complications, to say nothing of their influence in creating that large army of socially maladjusted people so commonly called "radical agitators," "the unemployable," the "down-and-outers," and the "ne'er-do-wells." The psychiatric method ought to be of value not only in eliciting the causative factors underlying work failure and in many instances adjusting the employee, with an improvement in production, but also in discovering promotional material.¹

The modern personnel approach in industry is essentially a clinical one. There has been a shift in emphasis from adjustment through selection alone to the study and correction of maladjustment among workers already employed. There is a growing recognition that efficiency in production cannot be assured by scientific selection unless there is also some effort made to secure the readjustment of the worker already employed. The clinical method means that every factor affecting the adjustment of the worker is weighted—aptitude, temperament, interest, and working conditions. If repetitive labor is proving conducive to fatigue, boredom, and monotony, some way

¹"Psychiatry in Mercantile Life" (a digest of a talk by V. V. Anderson), *The Human Factor*, January 15, 1927.

may be found of introducing variation without interfering with productive efficiency. Viteles succeeded, by applying the clinical method, in securing the readjustment of 50 per cent of inefficient taxicab drivers who otherwise would have been discharged as the easiest way out for the employer.¹

Maladjustment may be prevented by training the individual employee in good work habits, healthy mental attitudes, proper vocational interests, purposeful use of energy output, physical hygiene, and insight into personal problems. A period of specialized training for the job is often worth while as a means of preparing the worker to operate efficiently, and of finding out his aptitudes and personal characteristics. The vestibule school, designed for this purpose, is a laboratory in which employees are tested and trained under controlled conditions. It has proved its usefulness in helping to guide workers into the right jobs.²

There are a number of factors involved in selecting an occupation, concerning which the intelligent young person will inform himself—the level of intelligence required by different kinds of work, the importance of personality qualifications, the satisfaction to be derived from various occupations, the jobs that are available, and the necessity for patience in waiting for promotion.

A person may have too much or too little intelligence for a given occupation. Anderson made a study of one hundred and fifty cashiers, whose job involved the handling of carriers. He found girls of average intelligence did best; girls of superior intelligence were not interested;

¹See M. S. Viteles: "Psychology and Industry," in *Psychology at Work*, P. S. Achilles, Editor. 1932.

²See H. C. Link: *Employment Psychology*, Chap. 21, "The Vestibule School." 1921.

See also R. W. Husband: *Applied Psychology*, Chap. 1, "Necessity of Scientific Vocational Guidance." 1934.

girls of lower intelligence could not learn the job quickly enough to become productive. The best cashier material, then, rated from 95-109 in I.Q.¹

Fryer tabulated the following intelligence standards for occupations. The scores are on the Army Alpha Intelligence Test:

OCCUPATIONAL-INTELLIGENCE STANDARDS FOR CERTAIN
OCCUPATIONS²

Average Score	Score Range	Occupation
161	110-183	Engineer
152	124-185	Clergyman
137	103-155	Accountant
127	107-164	Physician
122	97-148	Public school teacher
114	84-139	Draftsman
111	99-163	Y.M.C.A. secretary
110	80-128	Dentist
109	81-137	Executive (minor)
103	73-124	Stenographer and typist
101	77-127	Bookkeeper
99	78-126	Nurse
96	74-121	Clerk
85	57-110	Telegrapher and radio operator
83	64-106	Railroad conductor
78	54-102	Shipping clerk
69	46- 90	Policeman and detective
65	43- 91	Auto mechanic
65	44- 88	Carpenter
59	38- 81	House painter
21	13- 47	Day laborer (construction)

The individual must take his own personality into consideration in selecting his line of work. A special aptitude is not the only qualification necessary. The individual should be interested in the job.³ He should be coöperative

¹See V. V. Anderson: *Psychiatry in Industry*, pp. 145ff. 1929.

²D. Fryer: "Occupational Intelligence Standards," *School and Society*, 1922, 16, 273-277.

³Tests like the Strong *Vocational Interest Blank* are useful in this connection.

and adaptable, since employers today are placing more stress on such desirable personal qualities than formerly.¹ Job failures are often due to unwholesome attitudes and lack of interest, such as those displayed by a factory worker encountered by Whiting Williams, who made the remark while he was engaged on an easy job: "Dees fine job—take easy—mebbe make last all day."²

Too many people choose their occupations with the financial returns uppermost in their minds, rather than the psychological income, that is, the satisfaction to be derived from the job, which should be the essential consideration. The late Professor George Herbert Palmer, of Harvard, once remarked that if he were well off financially, he would gladly pay for the privilege of working in his chosen vocation. Fortunate is the person who can feel that way about his job. To the man who loves his work, financial rewards are incidental. This little item from *Time* will illustrate the point:

Died. Dr. Pierre Paul Emile Roux, 79, director since 1904 of Paris' Pasteur Institute; of pneumonia, after 40 years of tuberculosis; in Paris. With Pasteur, Mechnikov and others he worked on the prevention and treatment of anthrax, hydrophobia, syphilis, tetanus, cholera; was awarded a Nobel Prize in Medicine (with Dr. Emil von Behring) for work on serum therapeutics. Emaciated, white-bearded, he lived like a troglodyte in a barren room, slept on a camp bed, spent 80 cents per day for his meals of bread and soup, the rest of his \$800-a-year salary for books and equipment.³

The individual contemplating employment should consider the opportunities available in the various occupations towards which he is disposed: the hours, the pay, the congeniality of the surroundings, and the security of employ-

¹See A. H. Ruggles: "The First Job," in *Why Men Fail*, M. Fishbein and W. A. White, Editors. 1928.

²W. Williams: *What's on the Worker's Mind*, p. 19. 1921.

³*Time*, November 13, 1933.

ment. There are significant trends in occupational opportunities which make it advisable for a person to ascertain the proportion of available jobs with respect to the number of applicants, in a given line of work. A survey of occupational preferences among 1,000 girls in a junior high school in New York City revealed marked discrepancies between expressed preferences and occupational opportunities.¹ The intelligent person must adapt himself to the world's work of his time to the extent of training himself to fit the opportunities of employment as they exist, unless, of course, he happens to be that rare individual who can make his own opportunities.

There is one problem regarding occupation which particularly concerns the college graduate. Some employers complain that the university graduate is spoiled, that he has been given an exaggerated opinion of his own importance, that he is unwilling, therefore, to start at the bottom and work his way up according to the true American tradition. There is some truth, unfortunately, in this observation. The college student must be trained to realize that he must prove his mettle under fire, that he must practice patience in awaiting promotion, and above all, that he must recognize there are unpleasant tasks involved in every job.

C. Marriage. Most people look forward to a happy marriage as part of their plan of life. How can such an end be attained? Unfortunately, there is no formula available for assuring marital happiness, just as there are no set rules for winning a mate, once the heart has found its object of desire. Evidence is accumulating, however, which may guide the individual in choosing a partner wisely.

Since personality develops, it is possible that harmony may prevail in marriage at one time and not at another.

¹See W. V. D. Bingham: *Aptitudes and Aptitude Testing*, p. 107. 1937.

Recurring periods of poor adjustment are necessary conditions of growth, until the parties involved achieve a relatively mature and stable level of personality organization, mutually adapted one to the other.

Evidence for predicting adjustment in marriage has been gathered by Burgess and Cottrell. A study was made, over a period of several years, of 526 young married couples in Illinois, to determine the factors conducive to happy marriage. The subjects had been married from one to six years; they were mostly city folk, college or high school graduates, Protestants, more than half of them with an income of \$1,800 or more. Each person was asked to estimate the degree of happiness of his marriage. Ratings were on a scale:

Very happy
Happy
Average
Unhappy
Very unhappy

The individual was considered well adjusted if his replies indicated:

1. The individual regards his marriage as happy.
2. An essential agreement exists between the partners on critical issues in their relationships.
3. There is a substantial amount of common interests and common activities.
4. There are frequent demonstrations of affection.
5. There is a minimum of regret concerning the choice of the mate, or of complaint about the marriage, or the partner.

Of the husbands:

55.4 per cent rated their marriages very happy,
24.7 per cent happy,
11.9 per cent average,
5.6 per cent unhappy,
2.4 per cent very unhappy.

Of the wives:

- 51.8 per cent considered their marriages very happy,
- 27.5 per cent happy,
- 12.3 per cent average,
- 6.0 per cent unhappy,
- 2.4 per cent very unhappy.

In the 71.4 per cent of the cases, husbands and wives agreed in rating their marriages, and in 24.6 per cent they differed by only one step on the rating scale. The couples' friends' ratings agreed with their own in 48.5 per cent of the cases, and differed by only one degree in 42.7 per cent. In fact, there proved to be a consistent agreement between:

Partners

Outsiders and one of the partners

Two outsiders

The same person's ratings at different times.

The investigators examined in detail the relationships of married couples and reported these signs of a successful marriage:

Agreement in handling family finances has a high degree of positive correlation with happiness. Of those who always agree, 61 per cent are very happy, and only 3 per cent are very unhappy; of those who always disagree, 50 per cent are very unhappy and none are very happy. 7.1 per cent of those who always disagree, nevertheless rate themselves happy.

Frequent kissing of the wife by the husband is another sign of a happy family, as is the agreement on relations of intimacy.

Another indicator of successful marriage is agreement concerning friends and relatives.

Relatively unimportant to success in marriage are table manners and possession of an even temper.

Measuring the factors conducive to marital adjustment gives us some criteria with reference to which success in

marriage may be predicted. Good and bad matrimonial risks are distinguishable, as follows:

Likely to have a happy marriage is the person whose parents have been happy. Contrary to the general belief, the more strongly the husband and wife are attached to their parents, the more likely they are to be happy in marriage.

An only or youngest child is a poor risk unless married to an oldest or middle child. Most successful mating is that of an oldest child with another oldest.

The chances for happy marriage are enhanced if an individual marries another of similar family background.

A person is a good risk if he or she attended Sunday School after the age of ten; an even better risk, if he is still attending.

A good risk is a person who is a member of three or more organizations.

The nature of the occupation engaged in by the husband is important; regularity of income is more significant than its size.

A girl who has worked before marriage is a better risk than one who has not. A teacher or skilled office worker is likely to make a good wife. The girl who has changed jobs frequently is not a promising prospect.

The longer the prospective married couple have known each other, the more likely is their marriage to be successful. Optimum periods are five or more years' acquaintance, three to five years' courtship, and at least two years' engagement.

Marriages of affection and companionship are likely on the average to be more successful than those of infatuation and romance. Infatuation does not necessarily prognosticate a satisfactory sexual adjustment after marriage.

Desire for children is conducive to successful marriage. But, paradoxically, after children have arrived married persons are less happy than before. The presence of undesired children is extremely unfavorable to happiness.

These findings, according to the investigators, furnish "conclusive evidence that by the use of statistical techniques, prediction of success or failure in marriage is feasible, in terms, to be sure, not of the individual couple but of the group into which the couple falls."¹

The technique of marital adjustment is one of particular personal and social importance today, since, in America, about one in every six marriages ends in divorce. One of the grounds for divorce is incompatibility. Should a person conclude from such an observation that incompatibility is unusual in marriage relations and that its presence means divorce as the only real solution?

It is essential for an individual, married or unmarried, to realize that incompatibility in personal relations is the rule, and natural, and that harmony and complete compatibility are the ideal—something to be created, not the gift of the gods. We do not naturally come into tune with each other. No two faces are alike, no two characters are alike. The more developed a person is, the more he has discrepancies, peculiarities not shared by others. One partner in marriage may have a strong dominating will; the other may be yielding, devoted, self-effacing. That is not harmony, but obliteration, whether on the side of the man or the woman.

Consider some of the difficulties that may arise from the different tastes and interests of husband and wife:

How are the evenings to be spent? The husband may be fond of the opera, symphony concerts, and the theater. His wife may not care about any of these things. She may prefer to play bridge or sit at home and just knit.

Suppose they both like to spend their evenings quietly at home, listening to the radio—but they like different programs and there is only one radio.

¹E. W. Burgess and L. S. Cottrell: "The Prediction of Adjustment in Marriage," *American Sociological Review*, 1936, 1, 737-751.

Who is going to have the family car? If there are grown-up children, this issue may evolve into a serious dilemma.

Husband and wife may like different sorts of people. She may be a social climber, bent on associating only with persons belonging to "society." He may prefer his old "cronies" and a game of poker.

They may have different ideas on diet. He may be fond of meat; she may be a vegetarian.

When they decide to go to bed and forget their petty disagreements, the husband may be a "fresh air fiend" who wants the windows wide open; the wife may be sensitive to the slightest draft and she may, therefore, prefer to have the windows open a "tiny crack."

Taking all of these sources of disagreement into consideration, and allowing for many others unmentioned, we can appreciate the observation of one man who was "going through the mill," that "married people can't live like single people."

Wherever there is growing character, differences inevitably arise. In all human relationships, parenthood and childhood, marriage, business, citizenship, and international relations, we must deal with natural incompatibilities based on natural differences. The art of successful living is the art of preserving harmony while, at the same time, one allows the other person to evolve according to the pattern of his own individual nature. This tolerance must be mutual. Its cultivation depends fundamentally upon the growth of a reciprocal understanding.

mower Harriet Mowrer, Domestic Discord Consultant of the Jewish Social Service Bureau in Chicago, has applied the interview technique in helping people to solve the problems of their domestic discord. She points out, from long experience, that most individuals have already worked out for themselves interpretations of their marital situations before they take their problems to the social therapist.

These explanations, however, are usually moralistic; that is, they are designed to place the blame on the other party. A person's interpretation is planned in such a way as to absolve himself of responsibility, and friends and relatives are sought to support his contentions. Such an attitude is apt to be overtly antagonistic toward the marriage partner and toward others who take sides in the opposing camp. Partisanship precludes any objective examination of the rights and issues involved. Consequently, the individual who believes he has been wronged hopes, in his first contact with the social therapist, to be told that he is right and his marriage partner is wrong. In order to be more convincing in his contentions he is likely to resurrect his emotions as substantiating evidence of his position. The consultant is not interested in fixing the blame upon either the husband or the wife. The one concern of the social therapist is in probing for the attitudes and events leading to the domestic discord, and then helping the discontented individual to adopt a more objective interpretation of his situation.

When the situation is thus viewed in all its complexity, and both marriage partners come to realize that their conflict did not arise suddenly and mysteriously, but had its origin even before their marriage, they get understanding and with understanding comes tolerance. In this final stage the individuals concerned no longer react to their plight emotionally but view their situation with insight.

Personality differences contributing to domestic discord can only be understood in reference to the cultural backgrounds of the respective individuals. Economic patterns are a source of friction when a girl from a hard-working, thrifty family casts her lot with a shiftless, spend-thrift husband. Patriarchal patterns of family life may run counter to the modern romantic pattern which en-

courages the individual choice of mates. Since spinsterhood is regarded as a disgrace in our culture, the prospect of becoming an "old maid" may prompt a woman to take a man "who'll be a good husband and father," though not measuring up to her romantic ideal of what "her man" should be. One of Mrs. Mowrer's cases involved a woman who tried to get along with a husband reared as a pious orthodox Jew and, later, given to the practice of "free love." She could never tell which side of his nature was going to crop out next. It is no wonder she became a "nervous wreck."

Experience with such cases has convinced Mrs. Mowrer that the more extensive the cultural differences, the more likelihood there will be for misunderstanding and conflict, since the intimate give-and-take relationships of family life are apt to intensify the friction between conflicting personality trends.

The patterns of interaction responsible for domestic discord can usually be traced back to early life, since the personality is invariably characterized by a continuity in its evolution. A person meets the demands of marriage as he has met previous crisis situations. The pattern of marital discord, therefore, is determined largely by the ways in which each individual has adjusted himself to his problems prior to marriage. Although there are cases where the personality has become disorganized by the marriage situation *per se*, the domestic conflict, as a usual thing, is just one more situation with which the individual cannot cope.

It is important to approach the problem of domestic unhappiness genetically because the present difficulty is likely to be an outgrowth of the early personal history. The historical perspective prevents an overemphasis on the "causes" involved in the immediate situation. It is the original sources that must be uncovered.

Behavior patterns established in infancy and childhood are often the determining factors in creating domestic troubles. This assertion may be substantiated by observing the reactions of an adult who always had his own way as a child. His desire for response in married life takes the form of an exaggerated craving for attention. He demands praise and flattery. His wife must be generous with her sympathy and appreciation. She must pet him constantly and tell him he is "wonderful."¹

If it is the wife who was similarly spoiled in her childhood, she may reveal her desire for response by reacting jealously to any interests her husband cultivates which detract from the attentions she feels he should be paying to her. Thus one woman resented her husband's devotion to reading, his tinkering with electrical devices, and his listening to the radio. She felt he should give her his undivided attention.²

Difficulties in the sexual relationship can usually be traced to childhood training, especially in the case of women who have been taught that manifestations of lust are sinful and bestial. The shock of the first intimacy may involve profound emotional disturbances. Wholesome attitudes concerning marriage relationship are particularly important because sex is the first marital interaction demanding a mutual adjustment. One must not be misled into concluding that the sexual difficulty is the only factor in the situation, since a thorough investigation will reveal that the sexual problem is interrelated to other problems, all of which must be taken into account in analyzing the basis of discord.³ It is true, however, that the sexual maladjustment is probably basic. Cultural differences are often blamed by the individual for his failure to make

¹See H. Mowrer: *Personality Adjustment and Domestic Discord*, pp. 52ff., the case of Mr. E. 1935. Published by the American Book Company.

²*Ibid.*, p. 211.

³*Ibid.*, p. 151.

an adjustment, when actually the sexual problem is fundamentally responsible; for had there been greater identification in the response relations, much of the cultural conflict would have been repressed.

The individual is apt to be deceived in fixing the blame for his maladjustment upon superficial sources of friction, failing to probe into the underlying basic sources. Thus it is easy for a wife to lay the blame on her "in-laws": "My husband is just like his family. None of them is any good. It runs in the blood."¹ Such a projection provides a satisfying rationalization but it does not penetrate to the crux of the discord.

The sources of marital misunderstanding are apt to elude the comprehension of the persons involved because of the symbolic nature of behavior. Thus quarrels over bridge or over money may symbolize and thus disguise sexual incompatibility. Such situations can be treated more intelligently if their real significance is understood. Desertion may symbolize the wish of the husband to end the marital state; an attempt to escape from a hapless dilemma; a threat to "depart for good" unless he is treated better; a desire for attention. The problem cannot be adequately met unless these symbolical meanings are recognized.²

The interviewer in analyzing domestic discord must investigate the following factors, among others:

Was the person the oldest, youngest . . . child in the family? Was he pampered or ignored? Did he feel misunderstood? Who was considered the head of the family? How was discipline maintained?

What economic class did the individual's family belong to? What were his educational opportunities? Is there a conflict between what he'd like to be doing and what he is doing?

¹*Op. cit.*, p. 177.

²*Ibid.*, p. 221.

Was there any pre-marital sex experience? How much knowledge of sex was there at the time of marriage? What is the attitude toward children and childbirth?

Do husband and wife discuss business and finances? Do they go out together? Does one of them feel superior to the other?

Was there any family opposition to the marriage?

What does each person think is wrong with the marriage? How do they explain the failure in adjustment? What did they expect of marriage? How has that hope been modified or abandoned? What circumstances preceded the crisis? What are the plans regarding the future?

By surveying the early family organization, the cultural patterns prior to marriage, the social interactions between the family and the community, the conflicts within the family group, and the rationalizations offered to account for the difficulties, the social therapist gets a good idea concerning the sources of the marriage failure.¹ This insight is imparted to both partners and sometimes to relatives, so that reëducation may proceed with the coöperative support of all the parties concerned. Many difficulties can be "ironed out" by this therapeutic procedure and harmony can be restored. Time and patience are both necessary in achieving a happy solution.

V. INDIVIDUALITY AND THE UNITY OF PERSONALITY

Individuality is an embarrassing fact for the scientist, who is intent upon the observation of uniformity. Variation, however, is more significant, perhaps, than uniformity for the understanding of our fellow beings. In practical life, acquaintances must be dealt with, not by applying abstract laws concerning the mythical generalized mind, but by studying their individual natures.

¹*Ibid.*, pp. 18ff.

Strangely enough, individuation is apt to be neglected by the differential psychologist, who deals with variations in general rather than with the particular individual pattern of variability. The differential approach, in actual operation, implies that a person is a simple sum-total of his departures from the average.

Personalistic psychology, as expounded by Stern, is organized around the person as the fundamental concern of psychology.¹ From this point of view the growth of skill is regarded as the growth of a person; perceiving is the activity of some person who is doing the perceiving. This emphasis is much needed since *general psychology* is apt to be too general and not individualized enough. We must be reminded that ordinarily we are not dealing with mind in general but somebody's mind in particular.

There are two influences in modern psychology which incline the student to ignore the essential unity of the personality: first, the discovery of specificity in the realm of habit; and second, the analysis of personality into traits.

It was stated, earlier, that habits are apt to be specific to specific situations *unless* generalization enters in to produce a transfer of habit from one situation to another or *unless* common factors function to facilitate integration. There are many aspects of the learning procedure that may encourage a transfer, such as attitude, interest, aim, concept, ideal, and an understanding of principles. It is safe to assert that generalization will occur under a proper pedagogy, that is, teaching that stresses methodology and general principles.

The consistency of habits has been underestimated, partly because the methods of investigation have been lacking in penetration. Investigators have failed to recognize that specificity is often the result of a pedagogy

¹See William Stern: *General Psychology from the Personalistic Standpoint*. 1938.

committed to the idea that habits must be built in for specific circumstances; that honesty in the schoolroom, for example, must be acquired in the schoolroom. Observers who have confined their studies to children have failed to realize the significant fact that children's habits are apt to be more specific than are those of the adult. The results of investigating children, accordingly, have been erroneously applied to everybody without the proper qualifications.

There is too much self-consistency to be accounted for in terms of specific habits alone. How consistent must an individual be to qualify as integrated? The degree of integration is a relative matter, that is, it must be estimated by comparing the individual with others. Unfortunately, in the process of comparison the individual himself is often forgotten.

The reliability of a many-itemed scale is evidence in itself that there is some kind of generality in conduct. Low positive correlations between habits may signify that different individuals are not consistent in the same way; it does not signify that the individual is not consistent with himself in his own way. Common sense recognizes that each person has his style of life. In this respect common sense is wiser than the psychologists who are so impressed with the specificity of habit that they are led to ignore the underlying consistency which gives a personality whatever stability it possesses.

The importance of individuality is being increasingly recognized as psychologists are coming to realize that the problem of intra-individual consistency is just as fundamental as the problem of inter-individual uniformities.

The interest in traits has been influential in leading psychologists into the error of assuming that personality is adequately covered by assembling a list of inter-dependent traits. The investigator who analyzes per-

sonality must not lose sight of the essential coherence existing among the elements. There is some reaction now against trait studies because they have paid no attention to the integrated total personality.¹ The unity should be of as much concern to psychology as the elements.

The psychologist likes to use such recording instruments as galvanometers, kymographs, and scales but he is apt to discredit the most delicate of all recording instruments—himself. "The human mind is the only agency ever devised for registering at once innumerable variables and for revealing the relations between them. It is the one and only instrument capable of comprehension."²

VI. SHAPING THE PATTERN OF LIFE

A | An intelligent life must be based upon proper self-evaluation, allowance for growth, integration around social values, and a philosophy that gives perspective to our mundane existence.

| It is a wise person who discovers through experience what he can do and what he cannot do, with reference both to the range of his capacities and to the world of natural law. Much frustration is due to expecting the impossible and to wishing life were not so cruel in the denial of our fondest dreams. Hitching the wagon to a star, attempting the unattainable, feeling a vague urge to do something great without doing anything about it, head the individual for ultimate disappointment. Overvaluing the things we cannot have and undervaluing the things we already possess are habits conducive to unhappiness. Every person who is honest with himself in facing reality must recognize that regardless of his best efforts he may not achieve the ends he cherishes. Such being the case,

¹See Ross Stagner: *Psychology of Personality*, p. 31. 1937.

²G. W. Allport: *op. cit.*, p. 547. The author is much indebted to Allport for this section on individuality.

he must find his joy in the pursuit of the goal rather than in its realization.

In the give-and-take of everyday relations the intelligent person should become acquainted with his assets and liabilities. There must be no false conceit and no false modesty. There must be self-esteem without a feeling of self-importance. A personal stability may be thus achieved which will render the individual immune to slights and to ridicule. His mood cycles will be leveled out, rendering him more contented with life and making him an easier person with whom to get along. The resulting social adaptability will make life more pleasant for himself as well as for others.

The true test of an honest self-evaluation is a sense of humor which will permit the individual to join others in laughing at his own frailties. The insight given by a good perspective on himself enables him to objectify his personality so that he can see himself as others see him. Most people, it is found, rate themselves above average on their sense of humor. Such a rating is not only statistically unsound but it also reveals that many people lack that honest self-evaluation which is so essential to a happy life.

Another important factor in shaping the pattern of living is to allow for a continuous growth throughout the span of lifetime. Mental attitudes play a significant role in this matter. A person who keeps his curiosity alive in the eager, unending pursuit of knowledge may remain alert to the end of his days. Regarding his conclusions as tentative, instead of crystallizing them into infallible dogma, he is able to enjoy the suspense of uncertainty which gives a buoyancy to the spirit. Expanding horizons spur him on and on, in the quest for truth. Under such conditions, living remains an adventure in which recurring problems stimulate the mind to further research.

Some unfortunate individuals are set in their ideas early

in life, because of the persistent training given to them by dominating parents. They are never given a chance to think for themselves. For such persons a college education, in awakening the dormant initiative for critical judgment, may precipitate an unhappy emotional crisis. A boy brought up in a narrow intellectual atmosphere may pass through a period of conflict involving severe emotional repercussions, when he encounters the broadening influences of university study. The result may be an enduring disillusionment, as it was in the case of a young man who reports on "What College Did to My Religion."¹ An awakening of this kind, rude as it may be, can be a vital spur to growth, provided the teachers help the student find a new philosophy to take the place of the old and provided they instill in the pupil the insight to realize that knowledge is never absolute but relative.

There is a danger, too, that the college student will feel his education has reached its completion on Commencement Day. That day is well named, for it should mark merely the beginning of enlightenment. The increasing interest in adult education in our time is an indication that people are coming to appreciate the fact that education should be a permanent process. Some colleges invite their alumni to return every year for a brief period of study. Thus the spirit of intellectual adventure is kept alive by continued stimulation.

The individual who intends to keep on growing through the years may look forward to old age as one of the richest periods in life.² For many people senescence brings a tragic decay, a feeling of decrepitude, a sense of uselessness, and a state of mental torpor.

¹P. E. Wentworth: "What College Did to My Religion," *Atlantic Monthly*, 1932, 149, 679-688.

²See "Age Has Its Joys," (Anonymous) *Scribner's Magazine*, March, 1935.

See also Nina Wilcox Putnam: "Growing Old and Liking It," *Commentator*, October, 1937.

Growing old is often traceable to living on the past. The person has nothing to look forward to. His thoughts are always memories rather than anticipations. People who are too much enamored of youth are often disappointed in old age.

If a person wants to enjoy the later days of life, he must prepare himself by the cultivation of avocational interests that can be carried over to the period of retirement. Recreational leisure-time activities should be practiced through early adulthood and middle age so that a person will know what to do with his spare time. When the individual feels his powers waning, he must not "let himself go." He must make an effort to remain alert by following a schedule calling for self-disciplined activity. Dr. Lillian Martin has demonstrated what can be done in the technique of enjoying senescence. Retired from Leland Stanford University at sixty-five, she looked around for something constructive to do and found it in the reëducation of the aged. Her career was just beginning. At 78 she published *Salvaging Old Age* and at 82, *Sweeping the Cobwebs*. She simply refused to decline. It is possible, as she has shown, to grow old gracefully.¹ It can be done.

The impression is sometimes conveyed by mental hygienists that integration is a worthwhile goal in itself. Such a point of view must be definitely qualified, since integration may interfere with growth and with the development of a rich, variegated experience.

A certain degree of inconsistency is involved in growing. Variation is an integral process of the evolving personality. Change is bound to upset, momentarily at least, the state of integration. Emerson pointed out in his essay on *Self-Reliance* that "a foolish consistency is the hobgoblin of little minds. . . . With consistency a great soul has nothing to do. He may as well concern himself with

¹Charles Courtenay: *On Growing Old Gracefully*. 1936.

in life, because of the persistent training given to them by dominating parents. They are never given a chance to think for themselves. For such persons a college education, in awakening the dormant initiative for critical judgment, may precipitate an unhappy emotional crisis. A boy brought up in a narrow intellectual atmosphere may pass through a period of conflict involving severe emotional repercussions, when he encounters the broadening influences of university study. The result may be an enduring disillusionment, as it was in the case of a young man who reports on "What College Did to My Religion."¹ An awakening of this kind, rude as it may be, can be a vital spur to growth, provided the teachers help the student find a new philosophy to take the place of the old and provided they instill in the pupil the insight to realize that knowledge is never absolute but relative.

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See also Nina Wilcox Putnam: "Growing Old and Liking It," *Commentator*, October, 1937.

Growing old is often traceable to living on the past. The person has nothing to look forward to. His thoughts are always memories rather than anticipations. People who are too much enamored of youth are often disappointed in old age.

If a person wants to enjoy the later days of life, he must prepare himself by the cultivation of avocational interests that can be carried over to the period of retirement. Recreational leisure-time activities should be practiced through early adulthood and middle age so that a person will know what to do with his spare time. When the individual feels his powers waning, he must not "let himself go." He must make an effort to remain alert by following a schedule calling for self-disciplined activity. Dr. Lillian Martin has demonstrated what can be done in the technique of enjoying senescence. Retired from Leland Stanford University at sixty-five, she looked around for something constructive to do and found it in the reëducation of the aged. Her career was just beginning. At 78 she published *Salvaging Old Age* and at 82, *Sweeping the Cobwebs*. She simply refused to decline. It is possible, as she has shown, to grow old gracefully.¹ It can be done.

The impression is sometimes conveyed by mental hygienists that integration is a worthwhile goal in itself. Such a point of view must be definitely qualified, since integration may interfere with growth and with the development of a rich, variegated experience.

A certain degree of inconsistency is involved in growing. Variation is an integral process of the evolving personality. Change is bound to upset, momentarily at least, the state of integration. Emerson pointed out in his essay on *Self-Reliance* that "a foolish consistency is the hobgoblin of little minds. . . . With consistency a great soul has nothing to do. He may as well concern himself with

¹Charles Courtenay: *On Growing Old Gracefully*. 1936.

his shadow on the wall. Speak what you think now in hard words; and tomorrow speak what tomorrow thinks in hard words again, though it contradict everything you said today."

Wise men change; they preserve a continuity in life, not by saying the same, but different, and sometimes opposite things. It is no use to quote against them their past. Only one thing is more useless than to bring up against a statesman some of his previous utterances, and that is for the statesman himself, by ingenious and unconvincing arguments, to maintain that he has always said what he is saying now. The fact that campaign promises are sometimes broken is not always to be deplored; it may mean that the office holder is growing and adapting himself to changing circumstances. The electorate would not want him to be so well integrated as to be petrified.

Integration, then, must allow for evolution. The individual should regard his career in an historical perspective in order to provide conditions favorable to continuous development. Conflict should be tolerated to a certain extent so that growth may occur.

Integration may be achieved at the expense of breadth of experience. A narrow outlook may be more easily organized than a broad one. Systematization is not an adequate ideal if it means confining oneself to a simple, shallow existence. Growth toward complexity renders integration more difficult; and yet it adds a richness and profundity to experience worth achieving despite the sacrifice of some degree of unity. Integration on a simple level is undesirable.

The ideal of integration must also be related to social values. The criminal may possess a personality well organized around his anti-social outlook. He may know exactly what he wants in life. His point of view may be

uncomplicated and his aim, direct. But his goal is not worthy of emulation merely because it lends a unity to his personality. Something more is needed than mere integration—our ends must have social value if they are going to point the way to a satisfying mode of life. Character is more fundamental than integration *per se*. Consistency, without a social reference, is not a desirable ideal for mental hygiene.

Finally, an adequate philosophy of life must be attained if the individual is going to live intelligently. A person must be oriented in time. He must see that his life has direction. This can only be achieved by formulating purposes in terms of what life means in its total perspective. The vicissitudes of existence must be fitted into some sort of coördinated pattern to give them meaning.

A person has failed in the game of life when he arrives at the conclusion that the whole thing makes no sense. When there is no longer any inspiration, emotional bankruptcy has been reached. Jung testifies, "I am now convinced I have never had a case that did not originate in a spiritual unrest."¹ The physician of the future, therefore, is destined to become more of a psychic minister dispensing courage, confidence, and stoicism to his patients, all of whom are more or less disordered in nerves and discouraged in mind. The day in which the doctor's office was merely an adjunct to the apothecary shop has passed. Sadler has stated the case well:

In all preventive and reconstructive psychiatric efforts, one of the cardinal aims of the psychiatrist is to assist the patient in acquiring an adequate philosophy of living. The majority of patients who suffer from nervous, emotional, and mental disorders are proceeding through life more or less aimlessly. They suffer from the absence of invigorating motives and inspiring

¹Dorothy Giles: "The Wise Men of Science Come to the Manger," *Cosmopolitan*, January, 1938. See C. G. Jung: *Psychology and Religion*. 1938.

goals. All reconstructive psychotherapy aims to assist such psychic drifters and socially maladjusted personalities in becoming fairly well oriented, acceptably socialized, and in possessing themselves of an effective philosophy of living which will contribute to the augmentation of health, happiness, and efficiency.¹

An intelligent life has balance and proportion. No single aim is overemphasized at the expense of others equally fundamental. When the sexual drive becomes the one interest in life, the pattern of living is thereby distorted. A woman whose one goal is captivating men loses her hold on life as her beauty fades in middle age. The beauty parlor may postpone the evil day when she must resign herself to the march of time but what she really needs is a new philosophy of life which will recognize that there are other things to live for. The intelligent woman has long since discovered that "beauty is skin deep," that personal charm is more important than a good complexion, and that many of life's prizes go to the homely.

The pursuit of money often becomes the one aim in life in our culture. Everything else is neglected for the accumulation of wealth. A person may be so anxious to provide for future pleasures that he fails to live in the present. He is ever investing, seldom spending. Some day he hopes to indulge himself with the profits. The wise person budgets his money, his time, and his energy to live a well-rounded existence—now—and later.

Similarly, it is foolish to think that science is the only thing in life. Poetry, romance, and song must supplement the devotion to facts if living is to be enriched to its fullest. The rational and the affective aspects of human nature must both be nourished and satisfied if happiness is to be achieved. The search for a philosophy is more than an intellectual quest—it must involve feeling as well. As

¹W. S. Sadler; in a pamphlet entitled "Psychiatric Social Work."

Link has said, the college student is in danger of being over-intellectualized by his educational training, thus becoming "a fool of reason."¹ Jung, confirming this observation, asserts that much unhappiness is due to the fact that people today, in being over-rational, fail to find satisfaction for their spiritual needs.² Science does not provide the answer to all our problems.

Successful living cannot be based on accentuated iconoclasm. The critical spirit may be so exaggerated as to embrace everything coming under the individual's observation. Critical judgment is necessary to intelligent living but it is not the "be-all and end-all" of existence. Effective living must be founded on affirmation. The individual must find something he can believe in, some cause worth working for.

The happy person has learned to accept life, intellectually and emotionally, with all its triumphs and its disappointments.

In every active, ambitious person there arises a conflict between what he wants to do and what he is able to do—between desire and ability. He wants a large salary or a large income from his business; his earning power may not be above the average. He wants a position of high rank; he may lack the necessary qualifications or have no means of attaining it. He wants fine clothes, an expensive automobile, and a luxurious home; he may not have sufficient wealth to obtain any of these things. He wants a mate of exceptional beauty and charm; he may be able to find no one who meets his expectations. In these and in many other ways he fails to satisfy his instinctive longings.

His attitude in the face of these disappointments is a test of his real worth. If he adopts the unwholesome habit of blaming others for his lack of success; if he becomes sullen and angry at every rebuff; if he seeks consolation by telling a hardluck story to anyone who will lend a sympathetic ear; if he loses interest in

¹Link, *The Return to Religion*, Chap. 4, "Fools of Reason." 1936.

²C. G. Jung: *Modern Man in Search of a Soul*. 1933.

his work and in his personal appearance; if he indulges in worry or daydreaming; if he retaliates for fancied insults or injuries—if he does any of these things—he will not only fail to meet the test but render himself less able to satisfy other desires. He may even undermine his mental health.

On the other hand, if he meets disappointment with renewed courage and vigor; if he puts the ideal of service above the hope of reward; if he places a moderate estimate on his ability and strives cheerfully for the good things within his reach, he will gain strength and may gradually attain a mastery of himself and of his field of work that will yield much personal satisfaction and win for him adequate material rewards and a large measure of social esteem.¹

Happiness comes to those who have learned to “take it on the chin” when things go wrong, and who have learned what to do with their failures, by rising above them to aid others, similarly troubled, in their search for a satisfying pattern of life. The happy person not only accepts life—he loves it, and makes the most of it; because his morale is good, he is blessed with the courage to meet “the slings and arrows of outrageous fortune” with confidence and assurance.

SUMMARY

General psychology must be supplemented by a psychology of the individual. Though each individual is unique, a classification into types may be justified if such categories are regarded as convenient artifices. Descriptions were given for collegiate types; introverts and extroverts; crippled, stupid, lonely, queer, moody, frustrated, and perverse personalities.

Character is the personality viewed in its ethical aspects when considered with reference to its degree of socialization. Tests have been devised for measuring character,

¹Horatio M. Pollock: *Accepting Life*. No. 3 of a series of Mental Hygiene Leaflets issued by the New York State Department of Mental Hygiene, Albany, N. Y.

some of the best of these being developed by the Character Education Inquiry. Children should be taught ideals that will meet the actual needs of everyday life, as guiding principles.

The individual is a member of society. As such, he wants to have a pleasing personality. The acquisition of certain habits will help him to achieve that end.

Knowledge concerning conventions, customs, prejudices, and propaganda, is essential to the practice of good citizenship.

Personal problems arise in connection with education, occupation, and marriage. Psychology can help in solving the various difficulties involved.

In studying the specificity of habit and in analyzing personality into traits, we must not ignore the total structure of the individual. The unity of personality is a fact of fundamental importance.

The pattern of life should be shaped with four essentials in mind: a proper self-evaluation, a plan that leaves room for growth, an integration that tolerates inconsistency, and includes social values, and a philosophy of life that will serve as a foundation for meeting the problems of living successfully.

KEY

TO KNOWLEDGE OF THE UPPER SOCIAL STRATA

- | | |
|----------|-----------|
| 1. True | 9. True |
| 2. False | 10. False |
| 3. False | 11. True |
| 4. False | 12. False |
| 5. False | 13. False |
| 6. False | 14. True |
| 7. False | 15. False |
| 8. True | 16. False |

- | | |
|-----------|-----------|
| 17. False | 39. True |
| 18. True | 40. True |
| 19. True | 41. True |
| 20. False | 42. False |
| 21. False | 43. False |
| 22. True | 44. False |
| 23. False | 45. False |
| 24. False | 46. False |
| 25. True | 47. False |
| 26. True | 48. True |
| 27. False | 49. True |
| 28. False | 50. False |
| 29. False | 51. True |
| 30. True | 52. False |
| 31. False | 53. False |
| 32. False | 54. False |
| 33. True | 55. False |
| 34. False | 56. True |
| 35. False | 57. False |
| 36. True | 58. True |
| 37. False | 59. False |
| 38. True | 60. False |

NORMS FOR KNOWLEDGE OF THE UPPER SOCIAL STRATA

Quintile in Knowledge

Number of Questions
Answered Correctly

Uppermost Fifth	. . . . .	54-60
Second Fifth	. . . . .	50-53
Middle Fifth	. . . . .	45-49
Fourth Fifth	. . . . .	39-44
Lowermost Fifth	. . . . .	0-38

GLOSSARY
AND
INDEXES

GLOSSARY

Abience: tendency to diminish a certain activity, giving the organism less of the stimulus.

Abstract thinking: thinking that is carried on by means of concepts; it is not concerned with concrete objects.

Accommodation: changing the curvature of the lens so that light rays are focused on the retina.

Acetylcholine: chemical which mediates the nerve impulse in the cranio-sacral (parasympathetic) system.

Acquisitiveness: a desire to possess and hoard worldly goods.

Acromegaly: enlargement of the bones of the hands, feet, and face, due to the overactivity of the anterior lobe of the pituitary gland.

Adaptation: *positive:* lowering of the stimulus threshold.

negative: raising of the stimulus threshold.

Adience: tendency to continue or perpetuate some form of behavior, giving the organism more of the stimulus.

Adrenal glands: endocrine glands, one located over each kidney; each gland functions in two distinct parts, cortex and medulla, producing separate hormones.

Adrenin: secretion from the adrenal medulla; acts as a mobilizer of energy for physical exertion; produces the same internal responses as are induced by the excitation of the sympathetic portion of the autonomic nervous system.

Aerial perspective: a criterion of visual distance by which the recognition of the relative position of objects is accomplished; it involves such factors as indistinctness of outline.

Aesthesiometer: an instrument resembling a compass, having two sharp points which may be adjusted to various distances apart.

Affectivity: used, in a broad sense, to include such states as pleasantness and unpleasantness, joy and sorrow, elation and depression.

After-image: *positive:* retinal process, which, having started on its way, continues of its own momentum, maintaining the same color as the original.

negative: antagonistic changes in the retina which produce complementary colors.

All-or-None Law: If a nerve fiber is stimulated, it is stimulated maximally in each and all of its parts.

Alpha waves: the brain waves of larger amplitude.

Ambivalence: simultaneous existence of contradictory and contrasting emotions.

Anabolism: the process by which the organism builds itself up through the assimilation of organic matter.

Analogy: a form of logical reasoning in which comparisons are drawn between vital similarities in dissimilar fields.

Anarchism: the theory that governmental regulation of individual conduct is unnecessary or undesirable.

Animism: a theory which attributes life to inanimate objects.

Anthropomorphism: a theory by which animal behavior is explained in terms of human experience.

Aphasia: the total or partial loss of the use or understanding of language, the motor and sense organs remaining intact.

Appetite: a desire for the repetition of a previously experienced pleasantness, having to do especially with sex and food.

Aptitude: ability to excel in a particular line of endeavor; a "gift" or knack for performing certain acts of skill with facility and finesse.

Asceticism: discipline of self through abstinence or self-denial.

Association: formation of functional bonds among the psychological activities occurring during an individual's experience.

Associative inhibition: the prevention of a response by the interference of some previously learned association.

Attitude: a set predisposing the individual to adjust himself to a situation by means of a pattern of behavioral and mental reactions acquired from his past experience.

Attributes: characteristics of sensations, such as quality, intensity, and duration.

Aufgabe: a determining tendency which is established by the setting of a problem.

Autistic thinking: thinking which gives the illusion of gratified desire since it is neither submitted to criticism nor made to square with reality.

Autogenous: self-generated.

Automatograph: an instrument for measuring involuntary movements of the body; various types for various parts of the body.

Autonomic nervous system: one of the three principal divisions of the nervous system consisting of a chain of nerve ganglia which lie outside the spinal cord; it is exclusively motor in function, controlling the smooth muscles and glands; it is organized into the cranio-sacral and sympathetic divisions.

Axon: slender fiber extending from the cell body of a neuron which conducts nerve impulses away from the cell body.

Barrier: physical or psychological boundary which limits a person's activity.

Basal year: the age at which a subject performs successfully all the tasks assigned to that age-level in an intelligence test.

Behaviorism: a so-called school of psychology interested in the observation and description of behavior in objective terms, without any reference to consciousness.

Beta waves: the brain waves of smaller amplitude.

Bias: a slant or bent; a pointing of the individual toward certain views and reactions.

Binocular parallax: a cue to visual distance, involving the difference in views obtained by the right and left eyes.

Blind spot: the region where the optic nerve leaves the retina; it is insensitive to ordinary intensities of stimulation.

Brain waves: fluctuations in electrical potential involved in cerebral activity, registered by the electroencephalograph.

Capacity: potentiality of an individual which limits the extent of development under optimal conditions.

Catalyzer: a substance which affects chemical reactions without itself undergoing change.

Catharsis: relief provided by the release of emotional tension through the reliving of an experience, either personally or vicariously.

Cell body: central cellular part of a neuron exclusive of the axon and dendrites.

Censor: Freudian mechanism which excludes anything from consciousness that violates the person's ideals.

Central nervous system: the brain and spinal cord.

Central tendency: the grouping of the majority on a distribution curve.

Cephalization: the progressive elaboration of the head as the center of supreme control.

Cerebellum: a portion of the brain located above and dorsal to the medulla, which coordinates the postural components of voluntary movements initiated by the cerebral motor cortex.

Cerebrum (cerebral cortex): the highest level of the nervous system, usually called the brain.

Character: an ethical concept with reference to which personality is given a moral evaluation.

Chronological age: duration of a person's life from birth to date.

Chronoscope: an instrument for measuring and recording time.

- Claustrophobia:** morbid fear of closed places.
- Closure:** process whereby an individual given part of a familiar whole completes the structure.
- Coefficient of correlation:** the degree of relation between two measures, falling between $+1.00$ and -1.00 .
- Cognition:** act of knowing.
- Commissural fibers:** nerve fibers connecting the right and left cerebral hemispheres.
- Compensation:** a defense mechanism by which the individual, to guard against one extreme in behavior, goes to the other extreme.
- Complex:** a system of emotionally toned ideas which functions as a tendency to produce actions of a certain definite character.
- Concept:** the organization of ideas into larger constellations of meaning.
- Condensation:** a process of dream-work in which several ideas are reduced to one symbol.
- Conditioned response:** a response elicited by a stimulus which was originally inadequate, but which has become adequate by association with an adequate stimulus.
- Cones:** sensitive photo-chemical substances, or structures, lying within the retina, which especially adapt the eye for daylight vision.
- Configurationism:** a so-called school of psychology, known as *Gestalt*, which emphasizes the shape and form of objects in perception, and the organization of experience.
- Consonance:** an auditory experience, consisting of an harmonious or melodious blend, which is pleasing in its effect.
- Contiguity, Law of:** a principle of association, by which two ideas are related because of their nearness either in space or time.
- Contrast, Law of:** one of the principles of association, by which two ideas are related because of their opposing characteristics.
- Controlled Association Tests:** tests which measure largely the speed and facility with which certain familiar associations can be reinstated; the subject's response is so restricted by the instructions that only one reply is possible.
- Conventionalization:** the principle that "there is a time and place for everything." (Sumner)
- Convergence:** a criterion of visual distance, dependent upon muscular strains involved in turning the eyes inward for near objects.
- Corpus collosum:** a band of commissural fibers uniting the right and left cerebral hemispheres.
- Correlation:** the tendency of certain paired measures to vary concomitantly.

Cretinism: imbecility and deformity due to a deficiency of the thyroid hormone.

Cutaneous: tactual.

Decibel: a unit of comparison for measuring the relative intensity of sounds; the lowest audible intensity of sound is zero decibel.

"Doodling": subconscious scribbling; a form of automatic drawing.

Decerebrate animal: an animal deprived of the cerebrum, for experimental purposes.

Deduction: a type of reasoning which starts with premises and proceeds to conclusions, by relating the premises.

Defense mechanism: mechanism which defends the ego against depreciation, usually by keeping from the individual's consciousness actions or thoughts which are unacceptable to the ego.

Delayed reaction: a response which is postponed for some interval of time after the presentation of the stimulus.

Delusion: a relatively stable false belief.

-of *grandeur*: an abnormal development of the sense of self-importance.

-of *persecution*: a morbid interpretation of the thoughts and actions of others as conspiracy against oneself.

Dendrite: the branching structure of the neuron which conducts the impulse to the cell body.

Determining tendency: a point of view, or a postural set, representing a readiness for acting or thinking in a definite way.

Determinism: a theory which states that the consequences of behavior are invariably due to antecedent causes.

Detour: an indirect path to a desired object necessitated by the presence of some barrier in the way of a direct approach.

Deviation: amount of variation from the mean or standard.

Dexterity Tests: tests designed to measure muscular coördination.

Displacement: change of outlet for an emotional drive; an indirect expression due to the blocking of the direct pathway.

Dissociation: a means of solving conflict by the separation of incompatible tendencies.

Distance receptors: sense organs which respond to stimuli not in contact with the body.

Distribution curve: graphic representation of the range of variability.

Disuse, Law of: a law of learning formulated by Thorndike which states that the bond between a stimulus and a response is weakened if it is not exercised for some time.

Drive: a need or desire for responding in a persistent fashion.

Duct gland: gland which has an outlet (duct) through which it secretes externally or into the alimentary canal.

Duplicity theory: the theory that the cones and rods of the retina are differentiated in both structure and function.

Dynamometer: an instrument for measuring muscular strength; the hand dynamometer is squeezed.

Effect, Law of: a law of learning formulated by Thorndike, which states that the greater the satisfyingness accompanying or following a given response to a certain situation, the more likely, other things being equal, will be the recurrence of the response to that situation.

Effectors: muscles, striped (skeletal) and unstriped (smooth), and glands, duct and endocrine, by means of which one responds to stimuli and makes the exact reactions necessary to efficient adjustment.

Ego ideal: an individual's conception of what he wants to become.

Eidetic imagery: a special form of concrete visual imagery, intensely vivid even after a long lapse of time.

Electroencephalogram: a brain wave record.

Electroencephalograph: instrument for recording brain waves.

Elementarism: a so-called school of psychology interested in an introspective analysis of consciousness into its elements—sensations, images, and affections.

Emotional age: level of maturity as reached by growing beyond childish patterns of behavior.

Empathy: feeling oneself into an object or into the situation of another person.

Endocrine gland: gland secreting hormones which are carried by the blood stream.

Enuresis: lack of bladder control.

Enzyme: a catalytic agent promoting digestion.

Epilepsy: a nervous disorder characterized by convulsions, biting of the tongue, and frothing at the mouth; it is usually chronic, and sudden in its onset.

Epinephrine: hormone of the adrenal medulla; same as adrenin or adrenalin.

Ergograph: an instrument which measures muscular work such as is involved in the lifting of a weight by means of a finger.

Erogenous zone: sensitive bodily region giving rise to sexual sensations.

Eugenics: that branch of biology which studies the transmission of hereditary characteristics, and which attempts to improve the endowments of human beings by eliminating the causes of undesirable characteristics.

Euphemism: a way of describing an offensive thing by an inoffensive expression.

- Eustachian tube:** the tube which connects the middle ear with the throat.
- Exercise, Law of:** other things being equal, exercise strengthens the bond between a situation and a response.
- Exhibitionism:** desire to expose the body, or, by sublimation, to attract attention by other means.
- Existentialism:** Titchener's term for describing his "Elementarist" point of view; see Elementarism.
- Explicit behavior:** expressive activity which can be observed.
- Exteroceptor:** a receptive organ which responds to stimuli outside of the body.
- Extirpation:** a method of studying localization of cerebral functions by cutting out a well-defined area of the brain in order to observe what function has been lost.
- Extrinsic interest:** satisfaction which is not derived from an activity in itself but from some ulterior objective which is not inherent in the bare performance.
- Extroversion:** term applied to the behavior of an individual whose interest is chiefly in the external world.
- Facilitation:** the process by which one activity causes another to be increased or exaggerated.
- Faculties:** special abilities, such as memory, feeling, and will, supposed to belong to the soul or to the mind.
- Feeble-mindedness:** a deficiency in intelligence falling below an I.Q. of 70.
- Figure and ground:** a *Gestalt* principle which describes the functional relationships between object and background as perceived by an observer.
- Final common path:** the single efferent path which is the outlet for competing impulses.
- Fissure of Rolando:** a lateral fissure of the brain, between the somesthetic and motor areas of the cortex.
- Fluctuation:** instability of attention to a stimulus.
- Forward conduction:** the irreversible direction of a nervous impulse from the axon to the dendrite, across the synapse.
- Fovea centralis:** the point of clearest vision on the retina, which lies directly behind the nodal point of the lens.
- Free Association Tests:** response to a word stimulus by the first word which occurs to the subject; may be continuous or discrete.
- Functionalism:** a so-called school of psychology which deals with activities of the mind and body, stressing the value of the former in facilitating adjustment to the environment.
- Functional disorder:** an illness, or maladjustment, with no organic basis, attributed to faulty mental habits.

"G": a general factor, postulated by Spearman, supposed to underly all kinds of intelligence.

Galvanometer: instrument for measuring the strength or direction of electric currents; used in detecting nervous conduction; the basic apparatus in the psychogalvanograph.

Gene: element in the germ-cell which determines the transmission and development of hereditary characteristics.

Genetic fallacy: the assumption that, in disclosing the origin of a belief, its validity is thereby discredited.

Gestalt: see Configurationism.

Gigantism: condition of enlargement of the bones produced by overactivity of the anterior lobe of the pituitary gland.

Glands: see duct and endocrine glands.

Glottis: a narrow aperture between the two vocal chords.

Glycogen: substance stored principally in the liver, constituting a reserve sugar supply for the muscles.

Gonads: duct glands for sexual reproduction: ovary in female, testis in male.

Habit: an activity which has been repeated so often as to become automatic.

Hair bulb: sense organ for touch in the skin, in regions where hairs are found on the surface.

Hallucination: mistaking ideas for perceptions; thinking of remote objects with sensory vividness.

Halo effect: the influence of a general impression upon a specific judgment.

Hormism: a theory which stresses the conative aspect of mind; behavior is interpreted as a striving for goals.

Hormones: substances produced by endocrine glands.

Hypnosis: state resembling sleep in which the individual is hyper-suggestible.

Idea: a system of images having a symbolic function.

Ideational learning: learning which involves the solving of a problem through the comprehension of meanings.

Identical twins: twins of the same sex developed from a single fertilized egg, thus having the same heredity.

Identification: see Introjection.

Idiocy: a mental deficiency, with a mental age of two years or less.

Illusion: erroneous interpretation of sensory data.

Image: an element of consciousness which is aroused in the absence of sensory stimulation and which represents some object previously observed.

Imbecility: a mental deficiency, with a mental age of from three to seven years.

Implicit behavior: a term coined by J. B. Watson to refer to a response which is not readily observed by another person.

Impressional tendency: a tendency for vivid experiences to be retained for a long time.

Incubation: a stage in the creative process during which the mind goes over information acquired in the previous stage of preparation.

Induction: the derivation of a general principle from particular cases.

Inhibition: process of checking an activity.

Insight: a sudden grasp of the relationships involved in problem-solving.

Instinct: an inherited pattern of response.

Integration: the process by which activities of any sort become organized.

Intelligence: a term used to describe the degree of efficiency with which the individual organizes his capacities to meet the various problems involved in living successfully.

Interest: a set motivating a person in a certain direction.

Interoceptor: a sense organ which responds to stimulation only from the viscera.

Interstitial cells: cells situated among the gonads, constituting the puberty gland, which secrete the endocrine sex hormone.

Intrinsic interest: satisfaction derived from an activity *per se*.

Introjection: the process by which an individual identifies himself with other objects or individuals external to himself.

Introspection: the direct observation of one's own consciousness.

Introversion: the centering of interest in one's own experiences.

I.Q.: intelligence quotient; the relation of mental age to chronological age. The ratio is obtained by dividing the mental age, M.A., by the chronological age, C.A., and multiplying by 100.

j.n.d.: just noticeable difference; the amount of variation which is necessary for the individual to become conscious of a distinction between a standard stimulus and a variable.

Katabolism: changes which occur in living matter, causing it to break down into less complex and more stable substances which are usually waste products; opposite of anabolism.

Kleptomania: irresistible impulse to appropriate the property of others.

Kymograph: a motor-driven cylinder for revolving smoked paper.

Latent content: according to Freud, the latent content is the true meaning of a dream; it is determined by interpreting the symbols which constitute the manifest content.

Learning: the modification of activity through experience.

Learning curve: a graphic representation of the relation between practice and performance.

Libido: according to Freud, libido is the energy of the sexual instinct; according to Jung, the life energy.

Limen: *D.L.*: differential limen; see *j.n.d.*

R.L.: stimulus limen; the least perceptible value of a stimulus.

T.R.: terminal limen; the highest perceptible value of a stimulus.

Linear perspective: a basis for judgment of visual distance, dependent upon the relations of the contour lines in the field of vision.

Local sign: qualitative differences in sensations mediated by sense organs, which enable the individual to localize them in space.

Logic: the science of correct thinking.

Logic-tight compartment: a mechanism for protecting the complex from rational criticism.

Logical memory: memorization based upon the comprehension of meaning.

Manifest content: the dream as the subject remembers it upon awakening; it consists of symbols.

Masculine protest: the desire to be manly, especially significant in women. (Adler)

Masochism: deriving pleasure (particularly sexual satisfaction) from being made to suffer. Cf. Sadism.

Maturation: the process of growth, dependent upon physical development independent of learning.

Mean: the arithmetic average in a series of measurements.

Meaning: the interpretation of one experience in terms of related experiences.

Mechanism: the theory that the organism is a machine, its behavior determined by physical conditions, irrespective of conscious choice.

Median: line drawn vertically through a distribution curve so that one half of the cases will fall on one side of it and the other half of the cases on the other side.

Medulla: portion of the brain, located forward and just above the juncture of the brain stem and spinal cord, which contains the nerve centers which control circulation and respiration.

- Memory-span:** the longest series of items which the subject is able to reproduce correctly after a single presentation.
- Mental age:** level of mental development attained by an individual at a particular time computed in terms of the chronological age of the average individual of equivalent mental ability.
- Metabolism:** process of energy exchanges in the living body involving anabolism and katabolism, *q.v.*
- Mind:** the awareness, consciousness, or experience of some individual, considered as a process or activity.
- Minimal stimulus:** see Limen: R.L.
- Mnemonic devices:** devices such as catch-words or formulas employed in facilitating recall.
- Mode:** that area upon a distribution curve where the largest number of cases are clustered.
- Motor areas:** region of the brain in front of the fissure of Rolando which controls motor functions.
- Myelinization:** enclosure of a nerve fiber by a myelin sheath.
- Negative adaptation:** see Adaptation.
- Negative instances:** exceptional cases which contradict the general trend of an inductive investigation.
- Negative practice:** elimination of an error by conscious repetition of that error.
- Negativism:** the disposition to do the opposite of what is suggested.
- Nerve:** a form of protoplasm specialized for conducting impulses, consisting of a collection of neurons arranged in series.
- Neurilemma:** outer membrane surrounding a nerve fiber.
- Neuron:** the structural unit of a nerve consisting of dendrites, cell body, and axon.
- Neurotic fiction:** a form of compensation in which the individual indulges in day-dreams of greatness.
- Nonsense syllables:** meaningless syllables, composed of two consonants with a vowel between; used in testing memory.
- Obstruction method:** measuring a drive in terms of the amount of obstacle the animal will overcome to obtain a desired objective.
- Oedipus complex:** fixation of the libido of a son upon his mother.
- Olfactometer:** instrument for presenting odors to a subject.
- Ophthalm-o-graph:** instrument for recording the eye movements involved in reading.
- Organismic:** description and interpretation of behavior in terms of the whole organism reacting to the total situation.
- Oscillograph:** instrument by means of which vibrations of energy, such as sound waves or light waves, are translated into a form that can be observed visually.
- Optical center of the eye*

- Paranoia:** a psychosis characterized by systematized delusions.
- Parasympathetic:** cranial and sacral divisions of the autonomic nervous system.
- Parsimony, Law of:** an hypothesis which states that the interpretation of phenomena should be based upon the simplest adequate explanation.
- Partial identity:** "Any part of a situation which causes a definite act may later call forth the same response either in part or in whole." (Butler)
- Particularistic fallacy:** generalizing on the basis of evidence that is inadequate because of insufficient sampling.
- Pathology:** a study of abnormal or diseased conditions.
- Perception:** the activity by means of which an individual becomes aware of stimuli through the medium of his sense organs.
- Perseveration:** the tendency of an impression or an activity to persist.
- Personal equation:** variability among individuals, each person being unique.
- Phantasy:** dreaming (pleasure thinking) which has no interest in reality, and is not directed toward constructive ends.
- Phi-phenomenon:** apparent visual movement; stroboscopic, *q.v.*
- Phobia:** a morbid fear, resulting from the repression of an earlier trauma.
- Pineal gland:** an endocrine gland located within the brain, the secretion from which serves to hold sex development in check until puberty.
- Pituitary gland:** a bi-partite endocrine gland located beneath the brain over the roof of the mouth; the anterior part controls bodily growth; the posterior part acts to raise the blood pressure, quicken the respiratory rate, and control retention of water within the cells of the body.
- Plateau:** a graphic representation of a temporary stage in the learning process during which no further improvement can be observed.
- Plethysmograph:** an instrument for recording varying blood volume in a limb submerged in liquid.
- Pneumograph:** an instrument used to measure respiration.
- Polarity of the neuron:** a descriptive term applied to the fact that the dendrite conducts the impulse to the cell body, and the axon conducts the impulse away from the cell body.
- Pons:** the transverse band of fibers which connects the right and left lobes of the cerebellum.
- Positive adaptation:** see Adaptation.
- Post-ganglionic neuron:** a non-medullated neuron, belonging to the autonomic nervous system, which slows up the rhythm of the nervous impulse.

- P.Q. (personality quotient):** term used by Link to represent the degree of success attained by an individual in his social adjustments.
- Primacy:** one principle in recall; first impressions are inclined to be lasting.
- Profile:** a psychograph on which is plotted the distribution of scores made by an individual on several tests.
- Projection:** process whereby a person externalizes elements in his own personality by attributing them to other individuals or to the environment.
- Proof-reader's illusion:** failure to recognize errors due to the fact that the reader unconsciously corrects mistakes as he reads the proof.
- Propaganda:** influencing collective attitudes by the artful use of suggestion devices.
- Proprioceptors:** sense-organs found in the muscles, tendons, and joints which mediate sensations of movement.
- Psychiatry:** the diagnosis and treatment of mental diseases.
- Psychoanalysis:** a special technique for the diagnosis and treatment of the psychopathic individual; based especially on the analysis of dreams.
- Psychogalvanograph:** instrument for recording changes in skin resistance occurring under emotional stress, which changes constitute the psychogalvanic reflex; see Galvanometer.
- Psychograph:** see Profile.
- Psychology:** the science which deals with the physical and mental activities of living beings.
- Psychophysics:** a quantitative study of the relation between physical stimuli and consciousness.
- Puberty gland:** the endocrine gland, consisting of the interstitial cells, which controls sexual functions.
- Purposive viewpoint:** interpretation of behavior in terms of its end.
- Pursuitemeter:** instrument to measure the eye-hand coördinations involved in keeping a stylus on a point shifting off center on a rotating disc.
- Pyramidal tracts:** group of comparatively long neurons which form one of the motor pathways in the central nervous system.
- Rationalization:** a process of reasoning, the aim of which is not to ascertain the truth but to satisfy a wish.
- Raw score:** the actual score attained by a person on a test, computed in terms of items correct or time consumed, or similar units of measurement; a score which has not been subjected to interpretation by reference to some standard.

Reality thinking: thinking directed toward the solution of some problem.

Reasoning: the organization of experience in accordance with the rules of inductive or deductive logic.

Recall: voluntary revival of a past experience.

Receptors: see Sense organs.

Reciprocal innervation: "the principle that the two motor centers which innervate a pair of mutually antagonistic muscles are related in such a way that as one of them comes into action and contracts its muscle, the other center commonly inhibits the antagonistic muscle." (Warren) The arrangement is important in producing the alternating flexion and extension of a joint, such as the knee joint in walking.

Redintegration: see Partial identity.

Reflex: involuntary automatic reaction under the control of sub-cortical nervous centers.

Reflex-arc: lowest level of coördinated activity in the nervous system.

Regression: a return to an earlier stage of development.

Reliability of a test: the consistency of individual scores on the repetition of a given test or equivalent test.

Repression: process by which a complex in conflict with the ego ideal is removed from consciousness and kept in the unconscious.

Residual tension: emotional hangover.

Resonance: sympathetic vibration.

Retina: the innermost coat of the eyeball, upon which the image is focused.

Retinal disparity: see Binocular parallax.

Retinal induction: simultaneous color contrast which occurs as the retinal substances tend toward equilibrium over the area of stimulation.

Retroactive inhibition: the interference of a later-learned activity with an earlier-learned activity.

Retrospection: introspection based upon the memory of past experience.

Reversible perspective: an example of the fluctuation of attention, in which ambiguous figures are perceived one way and then the other.

Route memory: mechanical learning, with no reliance on meaning.

Sadism: satisfaction derived from the infliction of cruelty on others.

Scatter: a statistical term denoting the deviation of individual cases from the standard.

Scatter-gram: a graphic means of representing scatter.

- Schizophrenia:** mental disorder of a dissociative nature in which the patient appears to lose interest in the world of reality, retreating into the realm of phantasies.
- Secondary elaboration:** giving a coherent account of a dream by filling in the gaps with fictitious supplementation.
- Secondary sexual characteristics:** those characteristics, appearing at puberty, which serve as differentiations between male and female.
- Semicircular canals:** sensory structures, located in the inner ear, which enable the organism to judge the position of the body in various planes.
- Sensation:** an element of consciousness; a simple sensory experience.
- Sense organs:** receptor mechanisms by which stimuli are received.
- Sensorium:** sensory area of the cortex.
- Set:** a temporary condition of expectation which determines, ahead of the stimulus, what the nature of an experience will be.
- Sex glands:** the gonads, which secrete the substance necessary for reproduction.
- Shell-shock:** a functional nervous disorder occasioned by a severe trauma, manifested in psychoses and allied symptoms.
- Skew:** the property of a frequency distribution curve that is not bilaterally symmetrical.
- Somesthetic:** sense of touch; used to designate the sensory area for touch, just posterior to the Fissure of Rolando in the cortex.
- Specific energies:** properties of sensory nerves which cause them, upon stimulation, to give rise to their own quality of sensation only.
- Sphygmograph:** an instrument which records the form, extent, and frequency of blood pulsations.
- Spinal cord:** an extension of the brain, constituting the lowest level of the central nervous system.
- Startle pattern:** primary and secondary series of facial and bodily movements occurring in response to sudden overstimulation, involving a complex experience of fear and anger.
- Stereoscope:** an instrument which blends two pictures, taken from slightly different angles, into one image, for the purpose of producing an impression of depth and solidity.
- Stereotypes:** preconceptions determining the classification of experience.
- Striped muscles:** muscles usually attached to the contiguous ends of adjacent bones; striated in structure; sometimes called skeletal.

- Stroboscopic movement:** illusion of motion produced by a series of pictures viewed in rapid succession.
- Structuralism:** see Elementarism.
- Subconscious:** term referring to experience characterized by a low degree of clearness, especially to behavior when the individual is only dimly aware of his own motives.
- Sublimation:** displacement of an emotion from a lower to a higher level.
- Subliminal stimulus:** stimulus below the threshold of consciousness. See Limen.
- Suggestion:** determination of judgment and induction of belief in a proposition under personal influence without regard to rational grounds.
- Summation:** the increasing effectiveness of stimuli which appear together either simultaneously or successively.
- Superstition:** a belief attributing an event to a supernatural cause.
- Syllogism:** a logical procedure for deducing a conclusion which is inferred from the relationship between two propositions called the major and minor premises.
- Symbol:** a representation of an absent object or situation.
- Sympathin:** substance, chemically similar to epinephrine, which is produced during the activity of the sympathetic division of the autonomic nervous system.
- Synapse:** place where the axon of one neuron comes into physiological relation with the dendrites of another neuron.
- Synoptic principle:** the view that truth can be ascertained only by the inclusion of all relevant evidence.
- Taboo:** a social regulation prohibiting certain acts.
- Tachistoscope:** apparatus for very brief exposure of visual stimuli.
- Tambour:** a pan-shaped disc with a thin rubber covering to which a stylus is attached for recording on a revolving drum.
- Teleology:** the interpretation of a process in terms of its purpose.
- Teletactor:** instrument for perceiving sound waves by means of the sense of touch; used in training the deaf to "hear."
- Temperament:** predisposition to pleasant or unpleasant emotions.
- Temporal lobe:** sensory area of the brain which functions as the center for auditory impulses.
- Tetany:** muscular convulsions.
- Thalamus:** tissue in the center of the brain vestibule through which all sensory impulses, save smell, must pass on the way to the cortex; the seat of affective experience.
- Thematic apperception:** a technique for investigating phantasy in which the subject reveals himself through his interpretations of situations with which he has identified himself.

- Thobbing:** term coined by Henshaw Ward to describe rationalization.
- Thymus gland:** a gland located in the lower neck, which acts to inhibit premature growth of the sex glands and the premature appearance of secondary sex characteristics.
- Thyroid gland:** a gland located near the windpipe, which influences growth through its effect on the rate of basal metabolism.
- Thyroxin:** the hormone secreted by the thyroid gland, largely iodine in content.
- Tonal island:** a section of the basilar membrane which does not respond to stimulation, causing deafness for tones in that frequency range.
- Tonal memory:** the ability to distinguish between two tonal sequences serially presented.
- Topological Method:** the representation of a drive in terms of its direction, strength, and point of application; an arrow designates the vector (direction and strength of the force); plus and minus signs designate positive and negative valences. Developed by Lewin.
- Trait:** a generalized determining tendency; an integration of a number of specific habits sharing a common adaptive significance.
- Transfer of training:** the improvement of a performance without actual practice, because of training in a related activity.
- Valence:** term used by *Gestalt* psychologists to represent the attracting or repelling value of objects or activities.
- Validity:** the agreement between a test score and the performance it is supposed to measure.
- Vector:** a concept for measuring, by means of an arrow, the direction and strength of a force.
- Verbalization:** putting a thought or a wish into words.
- Viscera:** internal organs such as the stomach, intestines, heart, lungs, and sex-organs.
- Vitalism:** explanation of activity in terms of a life force.
- Voyeurism:** derivation of sexual satisfaction from looking at sexual stimuli.
- Weber-Fechner Law:** a formula for representing the fact that relative stimulus intensities must increase or decrease proportionally in order to produce just noticeable differences of sensation.

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